A FAWCETT PUBLICATION

MODERN MECHANICS AND INVENTIONS

JAN. 25¢
IN CANADA 30¢

PLANE CABIN PARACHUTE
SEE PAGE 121

EXTRA
The Real
TRUTH
About the
WILKINS
POLAR SUB

Over the Mountains from Los Angeles

Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. That is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileage all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25% to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to the gallon and 25% in speed. We placed another on a Willys-Knight and increased from 12 to 17 miles per gallon."

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I have saved in gasoline these last few days has bought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste? Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck or tractor. It's actually less work than changing your oil or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

To Make up to $100.00 a Week and More

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
Dept. 779-A, Station C Milwaukee, Wis.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.,
Dept. 779-A, Station C, Milwaukee, Wis.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one Free. This does not obligate me in any way whatever.

Name .....
Address .....
City .....
County ..... State.....
☐ Check here if you are interested in full or part time salesmen position.

You've got to Fight this out with yourself

IN THE battle of life — trying to win promotions, earn more money, provide for old age — everything depends on *you*. Friends are good "seconds" but they can't deliver the knockout punch for you. That's something you must do for yourself!

The toughest opponent you've got is that old inclination in *you* to put things off. It is the trained man who wins today, in shop as well as in ring. Remember this: *No man becomes a champion in any line today without superior training!*

Have you the *training* which insures the success of your ambitions? Don't be a set-up for fate! A man's fighting years don't last forever—you must prepare yourself while opportunity is still ahead. Your problem is not unusual. Other men face it every day. Many of them have turned to the International Correspondence Schools—and, in turn, they have turned on their old fears and knocked them out with *training!* So can you, the only thing you've got to do right now is mark and mail this coupon. Don't delay — act today!

INTERNATIONAL CORRESPONDENCE SCHOOLS

"The Universal University" BOX 2317-N, SCRANTON, PENNA.

Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X:

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- ☐ Building Estimating
- ☐ Wood Millworking
- ☐ Concrete Builder
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- ☐ Structural Engineer
- ☐ Electrical Engineer
- ☐ Electric Wiring
- ☐ Electric Lighting
- ☐ Welding, Electric and Gas
- ☐ Telegraph Engineer
- ☐ Telephone Work
- ☐ Mechanical Engineer
- ☐ Mechanical Draftsman
- ☐ Patternmaker
- ☐ Machinist
- ☐ Reading Shop Blueprints
- ☐ Civil Engineer
- ☐ Highway Engineering
- ☐ Surveying and Mapping
- ☐ Gas Engines ☐ Diesel Engines
- ☐ Toolmaker
- ☐ Aviation Engines
- ☐ Bridge Engineer
- ☐ Automobile Work
- ☐ Plumbing ☐ Steam Fitting
- ☐ Heating ☐ Ventilation
- ☐ Sanitary Engineer
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City..... *State*..... *Occupation*.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

A FAWCETT PUBLICATION
Other Fawcett magazines are Screen Play, Triple-X Western, Battle Stories, Hollywood, Screen Book and Amateur Golfer and Sportsman.

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January, 1932

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National Salesmen's Training Assn.,
Dept. A-704, N.S.T.A. Bldg.,
Chicago, Ill.

Without cost or obligation you may send me your free book, "The Key to Master Salesmanship."

Name .....

Address .....

City ..... State.....

Age..... Occupation.....

They Laughed When I Mailed This Coupon

..But It Brought Me The Book That Showed Me How to Make $10,000 a Year!

AS I walked up to the mail box, Joe nudged Ed and winked broadly for my benefit.

"Sh!" he hissed in a loud stage-whisper. "This is going to be the big turning point in Frank Parker's life! He's writing for a book that tells how to get into salesmanship. Pretty soon he'll be earning so much that he'll make the rest of us look like pikers!"

Ed snickered.

"Won't it be grand!" he grinned. "Now he can quit punching time-clocks and eating 40-cent lunches." He raised his voice. "Drop me a postal sometime when you get out into big business and start making $10,000 a year, will you, Frank?"

They both laughed uproariously. And probably it did seem like a joke to them that a $30 a week clerk would have the nerve to think he could ever get anywhere or make real money without some special "gift" or "pull."

But they laughed too soon. Just yesterday I sat down and wrote to Ed who is still at the shop, dragging along at the same old job.

"Dear Ed"—I wrote. "You asked me to send you a card when I 'got into big business and started making $10,000 a year.' Well, here's your card. Yesterday I was promoted to the job of assistant Sales Manager of the Western Metal Works, at a salary that goes with it. I'll loan you my copy of that book on salesmanship you used to think was such a joke."

Only a book! Just seven ounces of paper and printers' ink—but it contains one of the most vivid and inspiring messages that any ambitious man can read. It reveals the real truth about the art of selling, explains the science of selling in simple terms, and tells exactly how the great sales records of nationally-known star salesmen are achieved. And not only that—it outlines a simple plan that will enable almost any man to master scientific salesmanship without spending a moment on the road—without losing a day or a dollar from his present position.

A Few Weeks—Then Bigger Pay

Reason it out for yourself. Salesmanship offers bigger returns and delivers them quicker than any other line of work under the sun. But many people have subscribed to the foolish notion that a man has to be "born" with some sort of "gift" for salesmanship. Nothing could be farther from the truth. Just like any other profession, salesmanship is governed by certain fundamental rules and laws—laws which you can master as easily as you learned the alphabet.

Right now an unusual demand for salesmen is being reported. City and traveling sales positions are open in nearly every line all over the country. Last year requests for trained men were received from many firms, in all quarters. This employment service is free to both employers and employees, and thousands have secured excellent positions this way.

Free to Every Man

See for yourself why "The Key to Master Salesmanship" has been the deciding factor in the careers of so many men who are now making $10,000 a year. See how A. C. Wallahan of Huron, So. Dakota used this training to become District Manager for his firm at a 400% pay increase. Find out how G. T. Patterson of Stillwater, Okla., left a small-pay job for a position that paid him up to $550 a month. Learn for yourself the REAL truth about the art of selling! If we were asking $2 or $3 a copy you might hesitate. But the book is now FREE. You do not risk one penny nor incur the slightest obligation. And since it may alter your entire future, it certainly is worth your time to fill out and clip the coupon at the top of this page. Why not do it now!

National Salesmen's Training Association
Dept. A-704
N.S.T.A. Bldg. Chicago, Ill.

Where Shall We Send Your Copy—FREE?

MAIL COUPON ABOVE TODAY

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Edited by Experts

Listed here are the members of the Modern Mechanics Board of Editors, all qualified by national repute to serve as authorities. They will gladly answer questions from readers if stamped envelope is sent. Address them in care of this magazine, 529 S. 7th St., Minneapolis, Minn.

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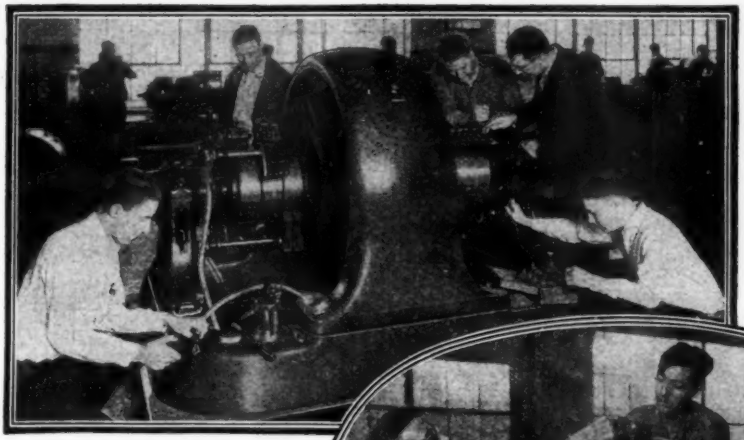


Coyne students getting actual experience on one of my big synchronous converters!

One of my Instructors explaining the operation of a radial airplane engine.

A BIG PAY JOB for YOU in ELECTRICITY

Don't spend your life in a dull, hopeless job! Don't be satisfied with a mere $30.00 or $40.00 a week! You don't have to! Electricity pays salaries of $60.00, $70.00 and more a week to thousands of fellows probably no smarter than you.

Learn By Actual Shop Work in 90 Days

Come to Coyne at Chicago and learn Electricity in 90 days—**not by correspondence, but by actual electrical work**—on huge motors and generators, switchboards, power plants, sub-stations, auto and airplane engines, armatures, etc. You don't need advanced education or previous experience. Coyne has been placing men in Big Pay Electrical Jobs since 1899. **Let Coyne help YOU to a good electrical position.**

Electrical Refrigeration

Right now I am including my Big Course in Electrical Refrigeration at no extra cost to you. This is a great new field of Electricity, offering scores of good jobs to the trained man.

JOBS PAYING $60 to $200 a week

Power Plant Operator	$50 to $70 a wk.
Maintenance Engineer	60 to 100 a wk.
Armature Winding . .	45 to 75 a wk.
Illumination Expert .	50 to 80 a wk.
Radio Service Expert	50 to 100 a wk.
Aviation Ignition . . .	60 to 125 a wk.
Battery Expert. . . .	70 to 200 a wk.
Auto Electrician . . .	75 to 200 a wk.
Contractor-Dealer . .	60 to 300 a wk.
Signal Engineering . .	50 to 100 a wk.

FREE EMPLOYMENT SERVICE

EARN AS YOU LEARN

My Employment Department gives you a FREE lifetime service. And if you'll need part-time work while at school to help pay living expenses, we'll gladly help you get it. MAIL COUPON FOR FREE PROOF THAT YOU CAN PREPARE FOR A GOOD ELECTRICAL JOB IN 90 DAYS! Get my Big Free Electrical Book—FREE Radio Service and Auto Electrical offers. Find out about my special low tuition. THIS DOES NOT OBLIGATE YOU IN ANY WAY. JUST MAIL THE COUPON!

COYNE Electrical SCHOOL

H. C. LEWIS, Pres. Founded 1899

500 S. Paulina Street, Dept. 12-53, Chicago, Illinois

FREE ELECTRICAL BOOK Coupon

H. C. LEWIS, President
Coyne Electrical School, 12-53
500 S. Paulina St., Chicago, Ill.

Dear Sir: Please send me your big Free Electrical Book and details of your Free Course in Electrical Refrigeration. This does not obligate me.

Name .....

Address .....

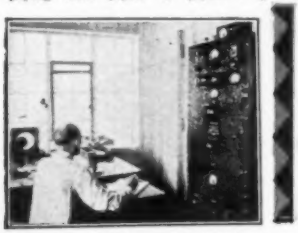
City ..... *State* .....

Broadcasting Stations offer fascinating jobs paying from $1,200 to $5,000 a year.

You're Wanted

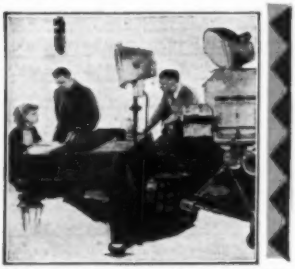
Take your pick of these fine Big Pay Radio Jobs

YOU have seen how the men and young men who got into the automobile, motion picture and other industries when they were started had the first chance at the key jobs—are now the $5,000, $10,000 and $15,000 a year men. Radio offers you the same chance that made men rich in those businesses. Its growth has already made men independent and will make many more wealthy in the future. Its amazing growth can put you ahead too. Don't pass up this opportunity for a good job and future financial independence.



Police Departments are finding Radio a great aid in their work. Many good jobs have been made in this new field.

Spare time set servicing is paying N.R.I. men $200 to a $1,000 a year. Full time men are making as much as $65, $75, $100 a week.



Talking Movies—an invention made possible only by radio—offers many fine jobs to trained radio men paying $75 to $200 a week.

Television—the coming field of many great opportunities—is covered by my course.

Many Fine $50 to $100 a Week Jobs Opening Every Year

Radio needs more trained men badly. Why slave your life away for $25 to $40 a week in a no-future job when you can get ready in a short time for Radio where the good jobs pay $50, $60, $75 and $100 a week? And many of these jobs can quickly lead to $150 to $200 a week. Many fine jobs are opening every year for men with the right training—the kind of training I'll give you.

I Am Doubling and Tripling Salaries

Where you find big growth you always find many big opportunities. I am doubling and tripling the salaries of many men every year. After training with me only a short time they are able to make $1,000 to $3,000 a year more than they were getting before. Figure out for yourself what an increase like this would mean to you—the many things that mean so much in happiness and comfort that you could buy with an additional $1,000 to $3,000 a year.

Many Make $10 to $25 a Week Extra Almost at Once

The day you start I'll show you how to do 28 jobs common in most every neighborhood that you can do in your spare time. I'll show you how to repair and service all makes of sets and do many other jobs all through my course. I'll give you the plans and ideas that are making $200 to $1,000 for my students while they are taking my course. G. W. Page, 2210 Eighth Ave. So., Nashville, Tenn., writes: "I made $935 in my spare time while taking your course."

You Have Many Jobs to Choose From

Broadcasting stations use engineers, operators, station managers. Radio manufacturers continually need testers, inspectors, foremen, engineers, service men, buyers and managers. Shipping companies, police departments, commercial land stations, aircraft companies, offer good operators jobs from time to time. There are hundreds of opportunities for you to have a spare time or full time Radio business of your own. I'll show you how to start one with practically no capital. My book tells you of other opportunities. Be sure to get it at once.

$400 a Month

"I spent fifteen years as traveling salesman and was making good money but could see the opportunities in Radio. Believe me I am not sorry, for I have made more money than ever before. I have made more than $400 each month and it really was your course that brought me to this. I can't say too much for your school."—**J. G. Dahlstead, Radio Station KYA, San Francisco, Cal.**

$800 in Spare Time

"Money could not pay for what I got out of your course. I did not know a single thing about Radio before I enrolled but I have made $800 in my spare time although my work keeps me away from home from 6:00 A. M. to 7:00 P. M. Every word I ever read about your course I have found true."—**Milton I. Leiby, Jr., Topton, Pennsylvania.**

Seldom Under $100 a Week

"My earnings in Radio are many times greater than I ever expected them to be. In November I made $577, December $645, January $465. My earnings seldom fall under $100 a week. I'll say the N. R. I. course is thorough and complete. You give a man more for his money than anybody else."—**E. E. Winborne, 1207 W. 40th St., Norfolk, Va.**

for a Big Pay Radio Job

I will train you AT HOME
free book gives facts and proof

I Will Train You at Home In Your Spare Time

Hold your job. There is no need for you to leave home. I will train you quickly and inexpensively during your spare time. You don't have to be a high school graduate. My course is written in a clear, interesting style that most anyone can grasp. I'll give you practical experience under my 50-50 method of training — one-half from lesson books and one-half from practical experiments. When you graduate you won't have to take any kind of a job to get experience—you will be trained and experienced ready to take a responsible job in the radio field of your choice.

Television and Talking Movies Included

My course not only gives you a thorough training in Radio — all you need to know to get and hold a good job—but also your choice, without extra charge, of any one of my special advanced courses: (1) Television, (2) Aircraft Radio, (3) Broadcasting, Commercial and Ship Radio Stations, (4) Sound Pictures and Public Address Systems, and (5) Advanced Radio Servicing and Merchandising. You won't be a "one job" man when you finish my course. You'll know how to handle a job in any one of Radio's 20 different branches of opportunity.

Lifetime Employment Service to all Graduates

When you finish my course you won't be turned loose to shift for yourself. Then is when I will step in to help you find a job through my Employment Department. This Employment Service is free of extra charge both to you and the employer. My Employment Department is getting three times as many calls for graduates this year as last year.

Your Money Back If Not Satisfied

You do not risk a penny when you enroll with me. I will give you an agreement in writing, legal and binding upon the institute, to refund every penny of your money if, upon completing my course, you are not satisfied with my Lessons and Instruction Service. The resources of the N. R. I., Pioneer and Largest Home-Study Radio training organization, stands back of this agreement.

Find Out What Radio Offers You—Get My Book at Once

One copy of my valuable book, "Rich Rewards in Radio" is free to anyone interested in making more money. It tells you where the good jobs are, what they pay, how you can quickly and easily fit yourself to get one. The coupon below will bring you a copy. Send it at once. Your request does not obligate you in any way. Act NOW.

J. E. SMITH, President

NATIONAL RADIO INSTITUTE

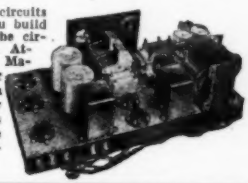
Dept. 2AH **WASHINGTON, D. C.**

Salary Three Times Larger

"Before I completed your course I went to work for a Radio dealer. Now I am Assistant Service Manager of the Sparks-Withington Company. My salary is three times what it was before taking your course. I could not have obtained this position without it. I owe my success to N. R. I. training." H. A. Wilmoth, Sparks-Withington Co., Jackson, Mich.

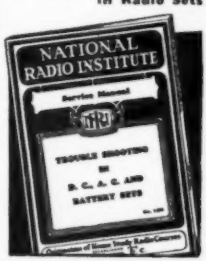
I give You 8 Big Outfits of Radio parts for Extensive Practical Experiments

You can build over 100 circuits with these outfits. You build and experiment with the circuits used in Crosley, Atwater-Kent, Eveready, Majestic, Zenith and other popular sets. You learn how these sets work, how to make them work. This makes learning at home easy, fascinating, practical.



Special Offer

Service Manual on Trouble Shooting in Radio Sets Sent Free



Act now and receive in addition to my big free book "Rich Rewards in Radio," this Service Manual on D.C., A.C., and Battery operated sets. Only my students could have this book in the past. Now readers of this magazine who mail the coupon will receive it free. Overcoming hum, noises of all kinds, fading signals, broad tuning, howls and oscillations, poor distance reception, distorted or muffled signals, poor Audio and Radio Frequency amplification and other vital information is contained in it. Get a free copy by mailing the coupon below.

Clip and mail NOW for FREE INFORMATION

J. E. Smith, President,
National Radio Institute, Dept. 2AH,
16th and U Sts., N. W., Washington, D. C.

Dear Mr. Smith:—Send me "Rich Rewards in Radio." Tell me more about Radio's opportunities for good jobs and quick promotion; also about your practical method of Home training. I understand this request does not obligate me and that no agent will call on me.

Name .....

Address ..... Age.....

City ..... State.....

How the LaSalle Problem Method Increases *Your* Salary

—Why in six months' time alone as many as 1,248 LaSalle members reported definite salary-increases totalling $1,399,507, an average increase per man of 89 per cent!

No matter what you are making now, you are interested in any plan which suggests a practical way to increase your earnings—within a comparatively short time. There is such a plan—it is known as the LaSalle Problem Method—and its practical value is attested by thousands of men who have employed it to plus their native aptitude with systematic training. Read these typical experiences:

Boosts Earnings More Than 500 Per Cent—"In 1920, I was employed in a local railroad office, and was earning only a living wage—I am now traffic manager of the King Company, the largest exclusive iron lamp post manufacturers in the United States, if not in the world . . . My training in Traffic Management with LaSalle is responsible for this advancement and the increase of more than 500 per cent in my earnings."

JOHN R. MEEKS, Sheffield, Ala.

Becomes Treasurer of Big Department Store—"My salary is now 300 per cent larger than it was when I saw the sign which led me to your school—and I am now Treasurer of the Palais Royal. I will be eternally grateful to you for my advancement and I recommend your training to every ambitious young man, for a $5,000 position is waiting for anyone who will take your training and apply himself."

W. F. HISEY, Washington, D. C.

Shop Laborer Becomes Lawyer—"When I enrolled in LaSalle Law training, I was a laborer in a shop. I worked all day in the shop and studied until late each night. I was soon promoted to the shopkeeper's office and then to accountant. In three years, I passed the Bar examination and a little later, I began the practice of law."

JOHN S. GIBSON, Douglas, Ga.

Stenographer Promoted to Comptroller—"LaSalle training in accountancy has been an important factor in my advancement from stenographer to comptroller of the Ranier National Park Company."

F. R. GRIFFITHS, Tacoma, Wash.

When thousands of men in the United States and Canada (not to mention many hundreds in England, Australia, China and other foreign countries) choose the LaSalle Problem Method to speed their progress—when over 4,000 LaSalle members belong to the LaSalle One Hundred Per Cent Club, having more than doubled their incomes—when the average increase reported by other thousands is 89 per cent—surely the LaSalle Problem Method must offer an unusually sound way of securing quickly the *kind* of experience that can be *cashed*. It does. And here are very good reasons why:

You Learn by Doing

Suppose it were your privilege every day to sit in conference with the head of your firm. Suppose every day he were to lay before you in systematic order the various problems he is compelled to solve, and were to explain to you the principles by which he solves them. Suppose that one by one you were to *work those problems out*—returning to him every day for counsel and assistance—

Granted that privilege, surely your advancement would be faster—*by far*—than that of the man who is compelled to pick up experience hit-or-miss.

Under the LaSalle Problem Method you pursue, to all intents and purposes, that identical plan. You advance by *solving practical problems.*

Only—instead of having at your command the counsel of a single individual—your Chief—you have back of you the organized experience of the largest business training institution in the world, the authoritative findings of scores of able specialists, the actual procedure of the most successful business houses.

Thus—instead of fumbling and blundering—you are *coached* in the solving of the very problems you must face in the higher positions. Step by step, you work them out for yourself—until, at the conclusion of your training, you have the *kind* of experience for which men are willing and glad to pay real money.

Send for Salary-Increasing Plan

The details of the LaSalle Problem Method—often spoken of as the *salary-increasing plan*—will be sent you for the asking. Whether you adopt the plan or not, the basic information it will place in your hands, without cost, is of very real and definite value. And—it's FREE.

Balance the two minutes that it takes to fill out the coupon against the rewards of a successful career—then clip and mail the coupon NOW.

LaSalle Extension University

THE WORLD'S LARGEST BUSINESS TRAINING INSTITUTION

Find Yourself Through LaSalle!

LaSalle Extension University, Dept. 1493-R Chicago

I would welcome an outline of the LaSalle plan, together with a copy of "Ten Years' Promotion in One," all without obligation.

- ☐ **Business Management**: Managerial, Sales and Executive positions.
- ☐ **Higher Accountancy**: Auditor, Comptroller, Certified Public Accountant, Cost Accountant, etc.
- ☐ **Expert Bookkeeping**
- ☐ **C. P. A. Coaching**
- ☐ **Paper Salesman's Training**
- ☐ **Traffic Management**—Foreign and Domestic
- ☐ **Railway Station Management**
- ☐ **Business Correspondence**
- ☐ **Railway Accounting**
- ☐ **Commercial Law**
- ☐ **Commercial Spanish**
- ☐ **Law**: LL.B. Degree
- ☐ **Industrial Management**
- ☐ **Modern Foremanship**
- ☐ **Personnel Management**
- ☐ **Banking and Finance**
- ☐ **Credit and Collection Correspondence**
- ☐ **Telegraphy**
- ☐ **Business English**
- ☐ **Effective Speaking**

free! mail coupon now

Name Present Position Address

BIG PAY JOBS

open

for the Radio Trained Man

Scores of jobs are open to the Trained Man—jobs as Designer, Inspector and Tester—as Radio Salesman and in Service and Installation work—as Operator, Mechanic or Manager of a Broadcasting station—as Wireless Operator on a Ship or Airplane—jobs with Talking Picture Theatres and Manufacturers of Sound Equipment—with Television Laboratories and Studios—fascinating jobs, offering unlimited opportunities to the Trained Man!

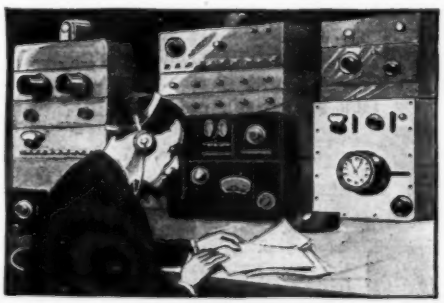
Ten Weeks of Shop Training

AT COYNE IN CHICAGO

COME TO COYNE IN CHICAGO AND PREPARE FOR THESE JOBS THE QUICK AND PRACTICAL WAY. NOT BY CORRESPONDENCE, BUT BY ACTUAL SHOP WORK ON ACTUAL RADIO EQUIPMENT. Some students finish the entire course in 8 weeks. The average time is only 10 weeks. But you can stay as long as you please, AT NO EXTRA COST TO YOU. No previous experience necessary.

TELEVISION *and* TALKING PICTURES

In addition to the most modern Radio equipment, we have installed in our shops a complete model Broadcasting Station, with sound-proof Studio and modern Transmitter with 1,000 watt tubes—the Jenkins Television Transmitter with dozens of home-type Television receiving sets—and a complete Talking Picture installation for both "sound on film" and "sound on disk." We have spared no expense in our effort to make your training as COMPLETE and PRACTICAL as possible.



FREE Employment Service To Students

After you have finished the course, we will do all we can to help you find the job you want. We employ three men on a full time basis whose sole job is to help our students in finding positions. And should you be a little short of funds, we'll gladly help you in finding part-time work while at school. Some of our students pay a large part of their living expenses in this way.

COYNE IS 32 YEARS OLD

Coyne has been located right here in Chicago since 1899. Coyne Training is tested—proven by hundreds of successful graduates. You can get all the facts—FREE. JUST MAIL THE COUPON FOR A FREE COPY OF OUR BIG RADIO AND TELEVISION BOOK, telling all about jobs . . . salaries . . . opportunities. This does not obligate you. JUST MAIL THE COUPON!

H. C. Lewis, Pres. *RADIO DIVISION* Founded 1899

COYNE ELECTRICAL SCHOOL

500 S. Paulina St. Dept. 12-1H, Chicago, Ill.

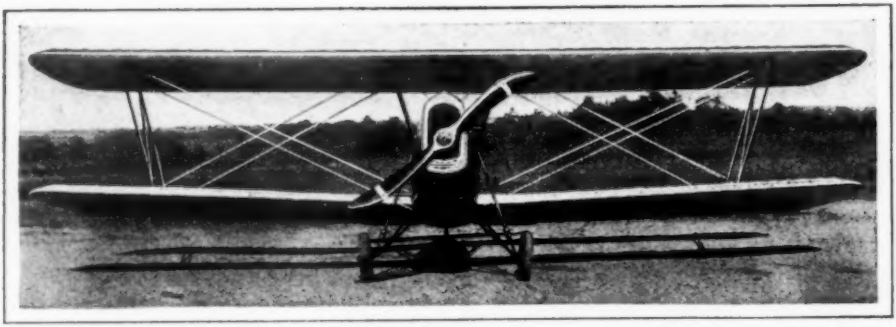
H. C. LEWIS, President
Radio Division, Coyne Electrical School
500 S. Paulina St., Dept. 12-1H, Chicago, Ill.

Send me your Big Free Radio, Television and Talking Picture Book. This does not obligate me in any way.

Name .....

Address .....

City ..... *State* .....



Right here, ladees and gents, we have a little biplane, built by Ben Epps of Athens, Ga. This little two-place job is powered with a Model A Ford motor, does 70 miles an hour on four gallons of gas, and comes in to land at 30 per. Fan mah brow, it's a honey! Have you drawn up plans for it, Ben?

Andy's Shop Mail Box

Andy, the high-powered, streamlined, Double M Grease Monkey, is with us again, with his usual pay load of gossip from the gang. Stick your nose down here and see what the boys are doing.

DURING the past couple of months I've turned this here column into a sort of open forum, in which the gang has been cussing and discussing everything from the merits of the magazine to the license situation. While all this has been going on I've been accumulating a pile of pictures and letters from the boys who have been building things. Just to catch up, the department is going to be heavy with these illustrated epistles this month. Here goes:

1211 High St.,
Pittsburgh, Pa.

Dear Sir:

Enclosed you will find a picture of my air-drive boat (down there in the corner). I have been running it for three years in shallow water. It does a little over 20 miles an hour. It has a two-cylinder Indian motor, a four-foot prop, and is controlled by the slipstream on the rudder which turns it very quickly in a small radius.

Yours truly,
ANDY HOOVER

As one Andy to another, that seems to be just the thing for nosing around some of these shallow lakes and rivers. It might interest the gang to know that Westy Farmer has designed for Double M a boat which is quite similar to Pittsburgh Andy's. It'll probably be in an early spring issue.

Now let's see what's going on in California:

Glendale, California.

Gentlemen:

As the photo shows (see next page), we are at last getting some of the big "noises," "Whiz Bangs," or what have you, interested in one of the real sports that we know other hams are wrapped up in.

Everybody knows Captain Billy Fawcett (he's the publisher of this here mag), but it is doubtful whether they all have seen him flying a glider. He believes glider flying to be the best way for a student to lay a foundation for any kind of a career in aviation.

As to the flying of our glider, we have had wonderful success. We have used both the shock cord and auto towing methods of launchings. I believe the shock cord

(Continued on page 14)

Something new in a water wagon by Andy Hoover of Pittsburgh. It does twenty miles per hour with an Indian motor.

Amazing Offer

to Two Hundred Ambitious Men

Interested in Auto Engineering

Whether you want to qualify as garage owner, repair expert or to improve your knowledge of theory and practice in automobile design and construction YOU SHOULD BE INTERESTED IN THIS OFFER; nobody has ever equalled it in the opportunities it presents for INCREASED EARNINGS. A bargain offer made to men who are interested in the automobile industry. READ EVERY WORD OF IT. Don't skip a sentence because only two hundred men will have a chance to profit by it.

Everybody knows the American School with its tens of thousands of students all over the world, everybody knows of the American Technical Society, the foremost publisher of technical reference books in the world—a company with over a million dollars of resources and with scientific contacts everywhere. We, the American Technical Society, have just made an arrangement with the American School which permits us to offer you a full course of instruction in AUTOMOBILE ENGINEERING at almost NO COST and to include with it our complete six volume cyclopedia of Automobile Engineering.

This offer is almost unbelievable but true, there are no strings to it whatever. It is positively limited to two hundred courses and offers you an unparalleled opportunity to forget the fear of wage cuts and lay-offs, to put yourself in a position to command a salary instead of wages and become an expert or executive instead of mere workman. As business continues to improve, the automobile industry will come back with a BANG—then, you will have your opportunity if you're ready for it.

Course includes complete set of Study sheets, question blanks. Examination sheets, grading by instructors.

Books have over 2500 pages. 3000 charts and illustrations. Every phase of automobile design, construction and repairs.

Standard in practically every great University Library.

Save Nearly $100

On this great offer you get all of the benefits of a complete course of instruction which would cost you at least $100 more elsewhere. You get it on a basis which is so reasonable that it will be easy to meet the conditions. You must be interested in automobiles. You must promise to spend at least thirty minutes a day (on an average) with the material we send you. You must convince us that you are really serious and want to make progress. This amazing offer is made for the purpose of introducing this course. The low price quoted is for advertising purposes only and when these two hundred courses are sold we will have no more to offer at this price. You can't make any mistake. Think of it. You deposit only $2.00 when the complete course, including six big automobile text books is delivered to you and then send us (if you are perfectly satisfied) only $3.00 a month until the total price of only $34.80 is paid—not one penny more do you pay us. And—think of this—these books alone have never been offered for less than $24.80.

Order right from this Ad.—*But don't send any money*

If you want to take advantage of this offer—this truly startling proposal to ambitious men, fill in the coupon, and send it to us today. No salesman will call upon you, BUT—we will send you the school's complete course of instruction and we will include with it the six big text books. Look them over, read the lesson sheets, find out anything you want to know, convince yourself that here lies an amazing opportunity—something which will enable you to defy the hazards of mere casual employment and put yourself in a position of independence and security. When you have satisfied yourself—then and then only do you agree to keep the course. Remember, you get all of the instruction and material which would be included in a course, selling elsewhere for at least $100 more.

Examination is Free

When you send in the coupon you don't obligate yourself to keep the course—you don't promise to pay anything unless ten days' examination and trial has proved beyond the shadow of a doubt that this is just what you have been looking for—that it can help you to a better job and bigger pay and that the thoroughness of its presentation of all automobile problems, makes it worth many times the price on this special offer. Use the coupon today. This advertisement is appearing in only one other magazine.

A Great Career *Now open to you*

The world never knew anything as great or as prosperous as the automobile industry. It has enabled hundreds of thousands to become successful, but only those men who had special training—who knew what they were talking about and who could design, build or repair, are numbered among the Big Men. If you are in this field now—prepare yourself for advancement. If you want to enter it—put yourself in a position to enter it upon a basis where you can meet the competition of other TRAINED men. Don't delay one single minute but mail the coupon now.

This offer includes free consultation privileges with Eighteen Experts

and a membership in the American Technical Society. You may write or wire any time for information on difficult subjects and the answers will be sent to you without cost.

AMERICAN TECHNICAL SOCIETY
Dept. A-1320
Drexel at 58th St. Chicago, Illinois

American Technical Society
Drexel at 58th St., Chicago, Dept. A-1320.

Gentlemen: You may send me the complete course which you offer in your special advertisement. Include the six big automobile books. I will deposit $2.00 upon delivery to me, with the understanding that this is to be returned immediately if I send the books and the course back to you within ten days. If I keep them, I will pay you $3.00 in thirty days and then $3.00 a month until the total of only $34.80 has been paid. I promise to give an average of thirty minutes a day to this work.

NAME .....

ADDRESS .....

CITY ..... STATE.....

This Magic Box

Turns Spare Time Into Money! Up to

$40 a Week!

without Leaving the House

We show you how to make big money decorating fast-selling Giftwares and start you off with the big, complete $10 Artist's Outfit shown above. Also Free Idea Book that has started hundreds of men making big, easy money. One Fireside Member says, "I made $100 on furniture in one week." Another writes, "My sales were $500 for 5 weeks. This is my first year." R. M. P., of Illinois, says, "I did $3500 worth of business last year and over $12,000 this year." D. W., New Mexico, reports, "I would not take $1000 for my Course." If you really want to make big money, a *guaranteed income* opportunity is now ready for you with Fireside. No tiresome study. You learn by doing. You make good money practically from the start. Our FREE Book tells you how. Send the coupon for it.

NO SOLICITING—— NO CANVASSING

It's easy to dispose of everything you make. Our new "Automatic Salesman" does all the selling for you. This vendor is designed to quickly find cash buyers for **all the Giftwares you can turn out! No soliciting or house to house canvassing required under this method.** Nor do you need any artistic ability in order to succeed. Simple "3-Step Method" makes the work easy to learn and easy to do. Under new Plan your membership need not—**should not**—cost you a penny. Get full details. Coupon brings everything.

FREE Book on Decoration

Mail the coupon NOW for the beautiful new Book on decorating at home for big money. A new Plan that gives you a quick start included free. Mail coupon now while openings for new members are still being offered.

FREE! of extra cost. Send coupon for details of amazing new Plan that tells how to get a big assortment of beautiful giftwares that you can decorate.

FIRESIDE INDUSTRIES
Dept. 142-A Adrian, Michigan

Fireside Industries,
Dept. 142-A, Adrian, Michigan.
Send me FREE Book on Home Decorating for a big steady income. Also how to get the big Artist's Outfit.

Name .....

Address .....

City ..... State.....

ANDY'S SHOP MAIL BOX

(Continued from page 12)

method to be safer for the beginner, although the auto towing can be made safe enough if the driver of the car is experienced or if he will follow instructions carefully.

For primary instruction regarding glider or sailplane flying, I would recommend "Glider Flying" by the United States Aviation Underwriters, Inc., 80 John St., New York City.

Our longest flights have been about a quarter of a mile, from an altitude of about three hundred feet. This, of course, was accomplished by auto towing. Great sport, eh what?

Well, I'll shut up and give some of the other guys a chance

Very truly yours,
BILLY MALONE,
N. C. Glider Pilot No. 369

Billy Malone and Captain Billy Fawcett. Above is pictured a test flight of the glider at Monterey Park Glider Hill, Monterey Park, California.

Glider flying is great sport, all right, and is fine if you're not going anywhere. Most of the gang, however, like to have a power plant with their wings, so my mail bag is top-heavy with airplane pictures. I'll show you a few:

(Continued on page 16)

WHAT CHANCE HAVE YOU TO MAKE MONEY?

Read THIS IF YOU WANT to STEP AHEAD

These ex-$3000 boys you see walking the streets today were just lucky in boom times. Today they don't rate $30 a week, many of them.

Today—you get paid for what you can *do*—if you're like No. 1 and No. 2 in the picture—and you get paid in proportion to what you *know* if you're a No. 3—4 or 5 man.

Today—if you want more money you've got to be worth it. And if you can do that without studying—you're a miracle worker, and we'd like to buy your system.

The depression has deflated old Lady Luck, as well as wages and other things.

Employers are hard-boiled today and they have to be—or go out of business.

Don't try to buck these facts. In 1921 to 1929 you may have had a fighting chance to make a good salary by bluff—or pull—or luck or accident. Today—you've got to deliver the goods, no fooling.

If you've been bumped enough to realize the truth of all this—if you want to increase your *earning* capacity by increasing your *service* capacity—mail the coupon and we'll show you how we can help you.

① FLAGMAN

Needs say 6 grades of schooling. Needs no experience. Competes with ten million dubs and unemployed. $18 to $20 a week when he works. To flag traffic, you don't need training. And you don't need pockets in your pants for money, either. No advancement, no future.

② PAINTER

Paid for physical effort mostly. Not paid for sickness or old age. Look out after you're 50 Mr. Painter, Mr. Carpenter, Mr. Machinist, Mr. Laborer. 8th grade schooling needed. The $50 a week salaries are gone forever. These jobs are yours for $25 and $30 a week—no more. A smart craftsman will take a course of training and get into the class of men who are paid for what they know.

③ FOREMAN

He has learned to "use his noodle." He has studied some. He is a boss. $40—$50—$60 a week. Not too smart to be above taking a course of training. Has or needs high school education. Must have some ambition or wouldn't be here. Keep it up old boy and you'll go higher.

④ ENGINEER

Some get it in college. Some get it by correspondence. Whichever way you get it, you've got something that no panic can take away. $3000 to $4000—$5000 a year and up. Lots of mechanics—building tradesmen, office clerks have become engineers with our help. Electrical, mechanical, civil or business engineers. Mail coupon, find out how.

⑤ MANAGER

They weren't born managers. They studied for it. They went through the mill. If they earn three times what you do, they know three times as much as you do. Pull doesn't count today. Luck doesn't count any more. It's brass tacks now. And you've got to go after it yourself—no one else will do it for you.

The American School

AMERICAN SCHOOL, Dept. G-139
Drexel Ave. and 58th St., Chicago, Ill.
Please tell me, without cost or obligation, about your training and employment service in line marked X below.

☐ DRAFTING

☐ Architecture	☐ Law
☐ Contracting & Building	☐ Civil Engineering
☐ Electrical Engineering	☐ Auto Engineering
☐ Business Management	☐ Highway Engineering
☐ Accounting	☐ Mechanical Engineering
☐ Civil Service Positions	☐ High School (in 2 years)

Name_____

St. No._____

City_____ State_____

Age_____ Occupation_____

Mail Coupon for Money-Saving Offer

FREE
The Road to Understanding
For Men Past 40

W. J. KIRK

WHY is 40 the "dread age" for many men? What is the "intimate" disorder that often robs them of vitality, health, joy of living? This daring free book answers these vital questions. Mail coupon for Free Copy.

WHY are many men past 40 suddenly afflicted with a dangerous ailment, that if neglected, may lead to wretched old age or perhaps grave surgery? The Free book answers this and other questions every man past 40 should know.

WHY do so many middle aged men suffer backache, leg and foot pains, sciatica, bladder trouble, night rising, chronic constipation and other so-called old-age ailments? Find the answer in the Free book.

HOW can one again frequently know the joy of living, get swift, lasting relief and feel 10 years younger in 7 days? Mail the coupon and learn how an amazing new drugless treatment is used and endorsed by prominent specialists.

The Truth About
Prostate Gland Trouble

Many men mistake these dangerous and distressing ailments for approaching old age and live lives of misery, when by simply re-stimulating a tiny gland—called the prostate—they might be enjoying vim and health. Already 100,000 men have tested the merits of a new drugless method of gland stimulation perfected by a scientist with offices in Ohio, California and England. Now many physicians, specialists, hospitals and sanitariums use and endorse it, for prostate gland failure. It is not a medicine, drug, massage, diet, exercise or violet ray. Its relief is not only usually quick—but lasting. Many users say it cleared up their distressing symptoms and made them feel 10 years younger in 7 days. Now it will be sent to you on a guarantee that if it doesn't do the same for you, pay nothing. If you want to know the joy of living, mail the coupon for your Free copy of "The Destroyer of Male Health."

W. J. KIRK, President

3849 Morris Ave. STEUBENVILLE, OHIO

If you live West of the Rockies, address The Electro Thermal Co., 303 Van Nuys Building, Dept. 38-C, Los Angeles, Calif. In Canada, address The Electro Thermal Co., Desk 38-C, 53 Yonge St., Toronto, Can.

W. J. KIRK, President,
3849 Morris Ave., Steubenville, Ohio.

Send free copy of your daring book, "The Destroyer of Male Health." Also facts about your Free Trial.

Name .....

Address .....

City ..... State.....

ANDY'S SHOP MAIL BOX

(Continued from page 14)

5342 Cuyler Ave.,
Chicago, Ill.

Dear Andy:

The enclosed photo (reproduced below) gives you an idea of the sport plane I built. Some sport, I'll say. After building for two years (ever since you ran plans for the Heath Parasol) I figured I was due for a hop. But before I got that chance a Cessna monoplane sneezed and blew her over, wrecking the fuselage.

Well, now I am a boy without a plane, but I still have a motor, pair of wings, wheels, etc., plus a lot of practical experience. I would advise the other fellows of the hangar gang to be careful where they park their little sky buggies; not behind another plane.

Yours for a more AVIATIONISTIC column.

HAROLD E. DALE

Hal Dale's Parasol before the Cessna sneezed.

Tough luck, Harold, ol' boy. I suppose you'll have your bus all rebuilt by the time you see this in print. That's one thing us aeronuts must expect—a lot of patching up after the crack-up. And if we're wise we learn something from each crack-up, until finally we get enough experience to fly without crack-ups. Then we can say we're pilots—if the bankroll lasts that long.

Our next communication is anonymous, but none-the-less interesting:

Detroit, Mich.

Dear Sir:

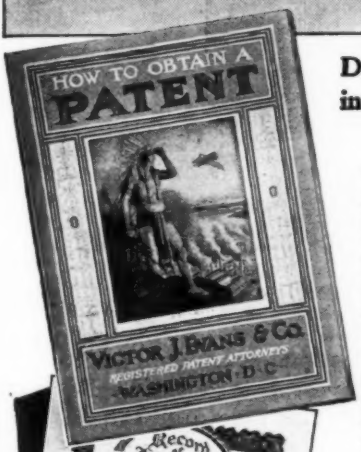
The accompanying photos show a new airplane which has been designed by a Detroit inventor. The wings fold overhead so the pilot can operate it on the highway between the landing field and his residence and have perfect vision, as he would in a car.

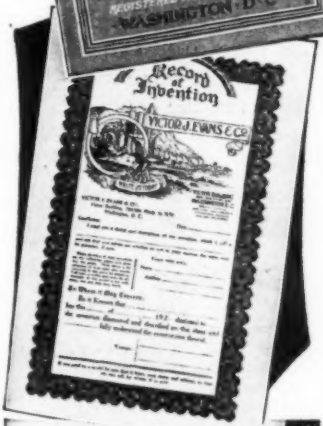
The wings were not built to scale on account of limited building space, but for a two-passenger plane the span is 24 feet, and it folds to a span of seven feet.

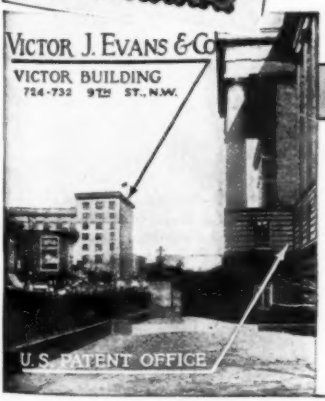
The most interesting feature of this plane

(Continued on page 20)

Send for FREE BOOK *"How to Obtain a* PATENT"







Delays may cost you thousands in profits from your invention. "Little ideas may have big commercial possibilities,"—protect them by Patents.

Our new FREE BOOK, "How to Obtain a Patent," gives you complete information on how to obtain the exclusive right to your invention and to the profits that may arise from it.

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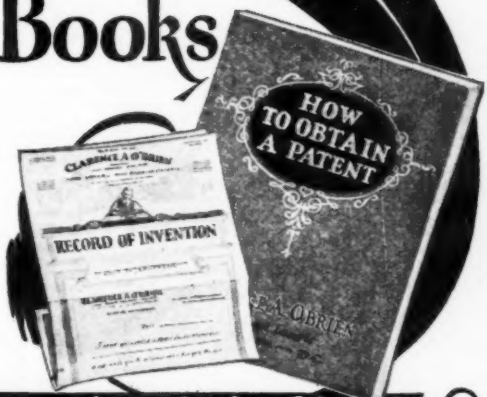

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"SIX YEARS AGO we sat down to figure what we wanted from life—Margaret and I. And to reach the comfortable scale of living we had set our hearts on, we found it would take $5000 a year! That seemed impossible, it was so much more than I was making, but Margaret had faith that I could do it.

"I enrolled with the International Correspondence Schools and started studying at home. At once I gained a new and wider view of my job—did better work. After four months the boss asked what had happened to me, and I told him. That day I got the first of my promotions.

"We passed the $5000 mark this year and we're going right on. Thanks to my I. C. S. training I can give my family an attractive home, a good car, all the comforts they need. It means school and college for the boys, more leisure for Margaret, and vacation trips for all of us. Do you wonder we're boosters for the I. C. S.?"

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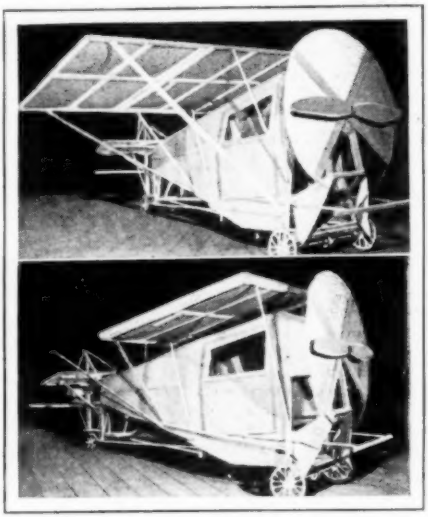
ANDY'S SHOP MAIL BOX

(Continued from page 16)

is the silencer seen just back of the propeller. It is not as solid as it appears, and the inventor claims that it will offer very little additional air resistance.

Oh Yeah? It seems to me that the most interesting feature would be to have the wings fold back, uninvited, while in the air. But then, my fears are no doubt unfounded, for one look at the pictures below convinces me that the only way to make the gadget take the air would be to push it off the roof. Judge for yourself.



This here is known as a folding-wing airplane.

Even the hangar gang is feeling the depression. Take a squint at this:

Longbranch, N. J.

Howdy Andy:

I just had the oil can pulled out of my innards, and when I'm still smelling that sweet smell I reach for the phone and tell the boss I'm all cut up, and he says, "That's too bad. When are you getting up?"

Sez I, "Tomorrow."

Sez he, "When are you coming back to work? And when you take a notion, go back to the bush and visit your relations."

They may have wild and woolly wind wagons in the West, but look what we have in the East. A one-place plywood cabin ship of original design and powered with a Velie 60 h. p. It is to be made into a two-place job soon and powered with a Cirrus motor.

Yours truly,
W. J. FELIX STROUD

(Continued on page 22)

TODAY Opens AVIATION'S Second Largest Opportunity TO You!

Only the successful transport pilot stands ahead of the capable line-service master mechanic when Aviation opens the door to advancement. The transport pilot's leadership is admitted by all. But . . . and this is important . . . Aviation recruits its second-largest quota of executives from among its line-service and master mechanics.

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Send me "Skyward Ho!" and full information about the $865 Airplane & Engine Master Mechanic's Flight Course.

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"You won't be laid off!"

"It's tough when fellows get laid off. They've been cutting down some at our plant and everybody has been worried, wondering where the axe would fall next.

"It made me feel mighty good yesterday when the boss stopped and said he had a better job in mind for me. 'It's trained men like you we need around here,' he said, 'and it's too bad we must let some of the untrained go. If those fellows had used the foresight you did, and studied with the International Correspondence Schools, we'd be mighty glad to keep them too. Trained men never need to worry about their jobs around here!'"

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☐ Electric Lighting	☐ R. R. Locomotives
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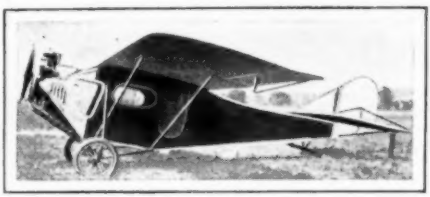
ANDY'S SHOP MAIL BOX

(Continued from page 20)



Felix tells us about this Velie cabin job.

Eemagine the boss giving you the air just because you wanted to ventilate your torso. Tough luck! But it only goes to show you that there's nothing in a name. Felix, you know, means "Lucky". Maybe you're lucky at that, in not having to work for that kind of a boss.

Our next job was not accompanied by a letter, so I can insert it in that vacant space immediately below.

This Heath Mid-Wing was built by Pat Newman of Akron, Ohio. It boasts of a top speed of 83 miles an hour and a welded steel fuselage.

NOW let's get our wheels back on the ground and see what's happening in the midget auto field.

Pukwana, S. D.

Gentlemen: (what-a-men!)

Enclosed is a snapshot of a small racing car which I built for my son.

I got this inspiration at the time you were putting on your Baby Auto Contest. As my son is only a little over four years old, he was a little too young for a high speed car, so this pedal propelled car is the result.

My boy has gotten so he can obtain a fair rate of speed with it on the sidewalk, and enjoys it very much. It took me about two weeks of my spare time to build it. Most of the materials I had on hand. The snap gives you a good idea of how it was constructed. After the frame-work was made I covered this with unbleached muslin and used nitrate dope to make it taut.

Very truly yours,
FRED. E. ENGLER JR.

Quite a neat little job, Fred, with air-

(Continued on page 24)

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Listen in direct to London, Paris, Berlin, Buenos Aires

A new radio thrill for you. Span the world with this set. Enjoy unique foreign programs from strange lands. Hear broadcasting stations from all over the world, via short waves. Your ordinary receiver cannot tune in these low-wave stations. World-wide receiver gets 14 to 550 meter stations with surprising clarity. Price of set, including 6 coils, $6.45; price in foreign countries, $7.75, postpaid.

ASTOUNDING AUTO RADIO BARGAIN

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This is the latest model 6 Tube Aero Pentode Auto Radio. Due to use of the latest Pentode tubes, this set is equal in performance to many 8 tube receiving sets. The circuit used is one which will be embodied in most of the expensive 1932 model auto radios. Complete set can be clamped on steering post of your car or can be operated by remote control from dashboard. Price of set only $20.00. Set complete with tubes, batteries, dynamic speaker, antenna equipment and noise suppressors, $39.50.

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Convert your AC or DC radio set into a short wave Superheterodyne. With this converter on your regular set you will be able to tune in short wave stations from many different parts of the world. The Aero Converter contains its own filament supply. B voltage can easily be obtained from your regular set, or you may use a single 45-volt B battery. No plug-in coils. Single tuning dial. Very easy to tune. No whistles or squeals. Uses 2 UX227 tubes, one as oscillator and one as mixer. Price, AC model, less tubes, ready for operation, $12.50, DC model for battery-operated sets, $11.50. 2 matched UX227 tubes at 75c each, $1.50; one 45-volt battery $1.45.

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Price $16.50. Here is a midget radio that everyone can afford that has performance, distance and tone qualities like the larger and much more expensive sets. Wonderful tone quality and selectivity. Full dynamic speaker. Full vision dial. Beautiful walnut finish cabinet. This is a 5 tube set and sells for $16.50. Price of complete set of 5 tubes is $4.50.

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Performance? World's altitude record; first place at National Air Races for years; scores of enthusiastic owners.

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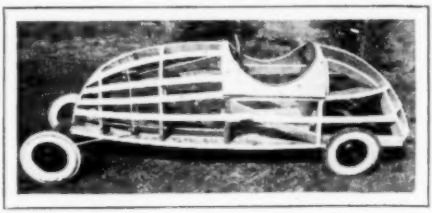
(Continued from page 22)



plane wheels 'n everything. What do you think of this next stunt?

706 New York St.
Lawrence, Kansas

Dear Sir:

I am enclosing a photo of an air-driven car (see below) which I constructed from three bicycle wheels and a few pieces of angle iron. It is powered by a Maytag washing machine motor which is a two-cylinder gasoline engine. The machine will travel about 20 miles an hour.

Very truly,
CARL R. WILLIAMS JR.

This highly original air-drive road zipper was built by Carl Williams of Lawrence, Kansas.

HANGAR NOTES

WHALEN NORMAN, who works, or at least draws his salary, at 1610 Pere Marquette Bldg., New Orleans, La., says he will answer all letters sent by light plane fans. He is especially interested in

(Continued on page 26)

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RAILWAY POSTAL CLERKS
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Raise to $225 Month

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These are steady positions. Strikes, poor business conditions, lockouts or politics do not affect them. U. S. Government employees get their pay for full twelve months every year. There is no such thing as "Hard Times" in the U. S. Government Service.

ALLOWANCE FOR HOTEL EXPENSES

Railway Postal Clerks now get $1900 the first year, being paid on the first and fifteenth of each month. $79.16 each pay day. Their pay is increased $100 and $150 a year. The maximum is $2700 a year, $112.50 each pay day. They get extra allowance for hotel expenses when away from home.

PAID VACATIONS

Railway Postal Clerks, like all Government employees, are given a yearly vacation of 15 working days (about 18 days). When on runs they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation, their pay continues just as though they were working. When they grow old, they are retired with a pension. As Railway Postal Clerks are continually traveling, they have an excellent chance to see the country. They are furnished with a railroad pass for official business. Spring examinations expected in a number of states.

City Mail Carriers—Post Office Clerks

Clerks and Carriers get $1700 the first year regular and automatically increase $100 a year to $2100 with further increase to $2300. They also have 15 days vacation. City residence is unnecessary.

What Will You Earn 5 Years from Now?

DO YOU EARN $1900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2700 OR MORE A YEAR, EVERY YEAR?

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ANDY'S SHOP MAIL BOX

(Continued from page 24)

Guenther's Midget, a picture of which I showed you in the October spasm.

DONALD C. MULLETT, who puts on the nose bag at R. F. D. No. 4, Wooster, Ohio, would like to find a partner to help him build a light plane. He is also in the market for a cheap airplane motor.

EMERY TYSON, from far-off Honolulu, says he will answer all letters received from motorcycle enthusiasts, especially those interested in the hill-climbing and racing game. He may be reached at 1311 S. Beritania St.

HENRY PECINA, who may be reached at 1920 South Cuyler Ave., Berwyn, Ill., has started construction of a Pietenpol Camper, and wishes to hear from others who are working on this job so that notes may be compared.

WELL, the only pictures I have left are about aviation, so if you're not an aeronut you can skip a couple of pages. We'll hear from Canada next.

Regina Flying Club
Regina, Sask.

Dear Sir:

Enclosed find photos and data in connection with a Heath Parasol built by Art Brazier, the Flying Club mechanic, and flown by myself.

It is a standard Heath, with welded steel fuselage and tail surfaces, wooden wings, and was built entirely by Brazier, all welding, covering, cowling, etc., being done in the Flying Club shop.

It was built with the idea of putting an Anzani in it, but as he was able to obtain a Johnson "32" very cheaply, Brazier decided to try it out first in the Heath.

The conversion of the motor entailed considerable work. First of all a thrust bearing had to be designed to take the propeller thrust, and a propeller hub had also to be made. The propeller is direct driven from the flywheel end of the crankshaft, and a magneto is driven from the other end. The water pump is situated underneath the magneto and is driven direct from an extension of the rotary valve shaft which also travels at crankshaft speed. From the back end of the pump shaft is driven the tachometer shaft.

The water cooling system consists of a radiator mounted underneath the cowling about four inches ahead of the fire wall with an air scoop carried forward from the radiator to the lower front cowling. The air enters through the louvres provided in the cowling and is directed by the scoop through the radiator. It then escapes

(Continued on page 28)

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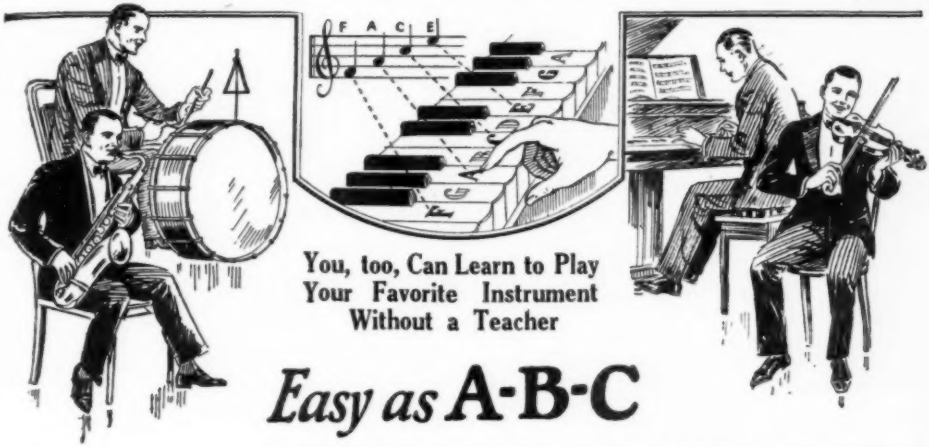
have learned music this easy way



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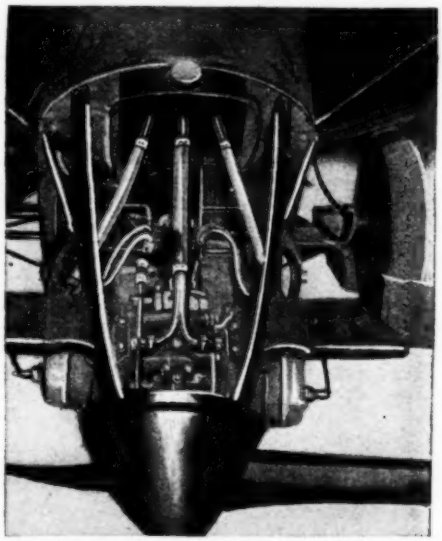
ANDY'S SHOP MAIL BOX

(Continued from page 26)



An overhead shot of Art Brazier's outboard motor installation on the Heath Parasol.

through openings left between the side of the fuselage and the engine cowling at both sides and below the radiator. The water pump takes the water from the bottom of the radiator and two water lines take the water from the water pump, one to each bank of two cylinders, whence three leads take the water up to a small expansion tank situated at top of fire wall.

The propeller was designed and made by Brazier and is a 23" pitch, and 4' 3" diam. This allows the Johnson to rev up to 3000 on the ground and 31000 r.p.m. in the air, at which speed the engine is developing, according to the power curve supplied by the manufacturers, 24 h. p.

In actual tests we have found the high speed in level flight is 60 m.p.h. The climb is rather slow but we are of course 2000 feet above sea level at Regina. Moreover the machine was built heavier than would have been the case had the builder contemplated installing the Johnson.

The cockpit is fitted with a full set of instruments; air speed indicator, tachometer, altimeter and spark and throttle controls. Shut off cocks are provided at all four outlets of the gas tanks and also a shut off cock is fitted between the small bubble tank and the carbureter inside the cockpit.

ROLAND J. GROOME

(Continued on page 34)

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STAMP, Coin, Paper Money, Relic Collectors. Bargain Price Lists 10c. Orren Krause, Harbor Beach, Mich.

QUIT Tobacco Easy. Harmless home treatment. The NI-KO System, Ojai, California.

MUSICAL

PLAY Piano by Ear. A sound system. Booklet free. Boucher's Harmony studio, Box 12, Ottawa, Can.

OUTBOARD MOTORS, BOATS

NEW Clymer Outboard Motors. Motorboats. Small gas engines. Terms. Catalog free. Clymer Motors, D5, Denver, Colorado.

PATENTS

INVENTIONS Commercialized. Patented or unpatented. Write, Adam Fisher Mfg. Co., 582 Enright, St. Louis, Missouri.

RADIO

TELEVISION kits for easy, inexpensive home assembly. Illustrated Manual, 10c. Federal Radio, Pewaukee, Wis.

MAKE Simple Crystal Radio. Crystal with instructions, 25c. Melomite, Fairmount Station, Kansas City, Missouri.

PERSONAL

YOUR Portrait drawn. Character sketch of yourself. Fulton Studio, Box 600, Cleveland, Ohio.

REAL ESTATE

OZARKS—Timbered, river lot, cabin; fishing, hunting, trapping, pearling; boating; $200, $10 monthly. Hubbard, 227 Grossman Bldg., Kansas City, Kan.

SALESMEN WANTED

SALESMEN—at last! New feature sells punchboards everywhere. Dealers wild with joy—prosperity back again—profits enormous. Samples free. Puritan Co., 1407 Jackson Blvd., Chicago.

RUN MY oil agency. No investment required. I divide profits 50-50 every week. $50 to $200 weekly your share. Products nationally known. My partners made $187,000 last year taking orders direct from farmers, auto owners, etc. All or spare time. Free Selling Equipment. Write quick. Central Petroleum Co., 715 Century Bldg., Cleveland, Ohio.

SCREW-HOLDING Screw Drivers! Not magnetic. Remove, hold, insert screws inaccessible places! Factories, garages, electricians, carpenters, mechanics, radio owners buy on sight! Free trial! Millen 5012, Winthrop Bldg., Boston, Mass.

LOCAL County Manager to service extinguishers now in use and demonstrate new patented device for Schools, Homes, Stores, Shops, Garages, Churches, Warehouses, Trucks, Autos and Busses. Our men are earning from $35 to $50 weekly on service work alone in addition to profits on sale of new equipment. Lifetime job for men who are reliable and ambitious to build up steady business. Successful men earn from $3,500 up to $10,000 a year. Large manufacturer with "A-1" rating. The Fyr-Fyter Co., 2224 Fyr-Fyter Bldg., Dayton, Ohio.

STAMPS

200 DIFFERENT stamps 10c. 60% discount approvals. Ask for United States price list. Seidenberg, Baroda, Mich.

STAMPS! 100 diff. 2c; 500 diff. 35c; 1000 diff. 90c. Tatham Stampco, D9, West Springfield, Mass.

WONDERFUL packet of 40 stamps from strange countries: Fiji, Tasmania, Mozambique, Siam, etc., with smallest stamp in the world for 10c. (No Europe) 25 Newfoundland and Canada 10c. Bargain Stamp Co., 277 M. West 23, New York.

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LEARN the Jewelry business. Watchwork, Jewelry and Engraving. Send for free catalogue. Bradley Watchmaking School, Dept. M, Peoria, Ill.

SONGWRITERS

SONGWRITERS — Read "Song Requirements of Talking Pictures, Radio, and Records" an explanatory instructive book SENT FREE to aspiring writers of words for songs. We compose, arrange music and secure copyrights. Write today. E. C. Newcomer Associates, 1674 Broadway, New York.

WE BUY Original Poems, Songs. Sunset Publishers, Box 1046, San Francisco. (Enclose stamped, addressed envelope.)

COMPOSERS—Verse or Music. Brilliant opportunity. Write VanBuren, 2557 McClurg Bldg., Chicago.

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SIGN Salesmen, let us tell you about a New Changeable sign, that sells for $1.50 and gives you 400% profit. National Sign System, St. Louis, Mo.

PAINT signs, complete instructions. New easy method 50c. Charles E. Fessenden, Bridgton, Me.

TELEGRAPHY

LEARN Wireless (Radio) and Morse Telegraphy. School, oldest, largest; endorsed by telegraph, radio and government officials. Expenses low—can earn part. Catalog free. Dodge's Institute, Clark Street, Valparaiso, Ind.

TYPEWRITING

TYPEWRITING—Duplicating Everything. Write Type-Art Service, 7 Coryell Street, Lambertville, New Jersey.

LUMINOUS PAINT

Make Your Watches, Clocks, Etc., Visible by Night The very latest discovery in the scientific world. Ritheric, practically unobtainable except at an exorbitant price, we have at last succeeded in producing this remarkable LUMINOUS PAINT, which, applied to the surface of any article, emits rays of white light, rendering it perfectly visible in the dark. **THE DARKER THE NIGHT, THE MORE BRILLIANT IT SHINES.** Quite simple to use. Anyone—you can do it. A little applied to the dial of your watch or clock will enable you to tell the time by night. You can coat the push buttons or switch plates of your electric lights, match boxes, and innumerable other articles; make your own Luminous Crucifixes, Luminous Rosaries, etc. Small bottle, price 25c. Larger sizes, 50c and $1 postpaid. JOHNSON SMITH & CO. Dept. 990, RACINE, WIS.

ONLY 15c Per Pair

Fighting Roosters

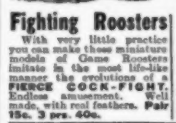
With very little practice you can make these miniature models of Game Roosters imitate in the most life-like manner the evolutions of a PIERCE COCK-FIGHT. Endless amusement. Well made, with real feathers. Pair 15c. 3 prs. 40c.

GOOD LUCK RING

Very striking, quaint and uncommon. Silver finish; skull and crossbones design, with two brilliant, flashing gems that sparkle out of the eyes. Said to bring good luck. Only 25c ppd.

Exploding Cigarettes

Box contains ten genuine cigarettes of excellent quality. They appear so real, but when each cigarette is about one-third smoked, the victim gets a very great surprise as it goes off with a loud BANG! A great mirth provoker yet entirely harmless. Price 25c box.



NOVELTY BADGES

Kissing Permit 10c. Two very novel metal badges, nickel plated, that are sure to cause fun out of all proportion to their trifling cost. 10c, each badge, 3 for 25c, or 75c per doz. postpaid anywhere.

Garter Inspector 10c

SURPRISE MATCHES

More fun than fighting with your wife. Look just like ordinary matches. As the victim tries to light one he gets quite a surprise. Price 10c per box. 3 boxes for 25c, 12 for 75 cents.

10c

MIDGET BIBLE

GREAT CURIOSITY Smallest Book in the World. Size of a postage stamp. 200 Pages. Said to bring good luck to the owner. A genuine work of art. Must be seen to be appreciated. Make good money selling them to friends, church acquaintances, etc. PRICE 10c each, 3 for 25c, 12 for $1.35, 100 for $7.50. Also obtainable in Leather Binding, with gold edges. Price 50c each, 3 for $1.35, $4.50 per doz. Magnifying Glass for use with Midget Bible 15c.

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Greatest boys' book ever written. Tells how to make a Pinhole Camera, a Canoe, model Railroad, a Telephone, Bioscope, a Telegraph Instrument, Box Kite, Talking Machine, Microscope, Electric Motor, Electric Door Bell, Water Wheel, Paddle Raft, a pair of Skis, a Dog Sled, Bird House, Rabbit Yard, etc. 64 pages. 150 illustrations. PRICE 10c.

BOY'S OWN TOYMAKER. A new book. Tells how to make chemical toys, electrical toys, galvanic toys, mechanical toys, paper toys, cardboard toys, boats, traps, etc. 300 illustrations. Price 25c postpaid.

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All about electricity in simple language. Tells how to make batteries, dynamos, motors, radios, telegraph apparatus, telephones, lights, electric bells, alarms, coils, electric engine, etc. Written specially for boys by electrical experts so anyone can understand it. 64 pages. 75 illustrations. ONLY 10c postpaid.

5-MINUTE HANDWRITING. A new easy self-teaching method. Teaches how to play, to use the tongue, tremolo, fully illustrated. Price 15c postpaid.

MONEY MAKING SECRETS. Golden opportunities for everyone. 64 page copyrighted book chock full of money-making ideas, recipes, formulas, trade secrets, etc. Tells of business that can be started with little or no capital at home in spare time. 10c postpaid.

TRICKS & SOCIAL ENTERTAINER. Contains hundreds of simple tricks, illusions, diversions that anyone can do. Also explains secret of second sight. Price 25c postpaid.

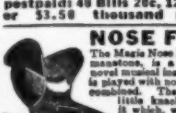
STAGE MONEY

With a bunch of these bills, it is easy for each person of limited means to appear prosperous by flashing a roll of these bills at the proper time and peeling off a genuine bill or two from the outside of the roll, the effect created will be found to be all that can be desired. Prices, postpaids 40 Bills 25c, 120 for 50c, or $3.50 thousand postpaid.

WONDERFUL X-RAY TUBE

A wonderful little instrument producing optical illusions both surprising and startling. With it you can see what is apparently the bones of your fingers, the lead in a lead pencil, the interior opening in a pipe stem, and many other similar illusions. Price 10c, 3 for 25c.

NOSE FLUTE



Post Paid 10c

The Magic Nose Flute, or Humanaphone, is a unique and novel musical instrument that is played with nose and mouth combined. There is just a little knack in playing it which, when once acquired after a little practice, will enable you to produce very sweet music that somewhat resembles a flute. No fingering, once mastered you can play all kinds of music with facility and ease.

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Box contains 12 eggs. When lit with a match, each one gradually hatches itself into a snake several feet long, which coils and twists about in a most lifelike manner. Price per box. 10c postpaid. 3 for 25c

THE BUDDY PHONE

A Real Telephone. Works Indoors or Outdoors. 100 ft. or 1000 ft.

Though this is merely a very clever toy, it is quite as serviceable for short distances as the most elaborate apparatus made and it is much less liable to get out of order or to need adjustment; in fact it cannot be rendered inefficient unless roughly handled. No troublesome battery, no intricate "hook-up." Can be put to practical use from one room to another, up or down stairs, around corners, etc. The patented sounding discs transmit and receive the voice perfectly, making it a really practical talking telephone. Set consists of two phones, transmission cord and full instructions. PRICE ONLY 65c per set postpaid. JOHNSON SMITH & CO.

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HAS REAL THREE NUMBER COMBINATION LOCK KEYLESS—CANNOT BE PICKED

Your money and valuables will be perfectly safe in this new Combination Thrift Vault and Savings Bank, because it has a real combination lock just like the regular Safes and Vaults. The lock requires three numbers to open it. There are over 34,000 different combinations. The lock is pick-proof. It cannot be opened by "listening" for the combination because it operates silently like the lock on a safe or vault. It is keyless in every sense of the word. No key is required. Once you learn the combination it can be opened in a moment or two. It takes coins of any size, currency, etc., or you can use it for storing jewelry and other valuable articles, and it keeps your private memorandums, etc., from prying eyes. Coins and currency can be placed in the bank through the slot at the top, but the larger articles will necessitate opening the bank by means of the combination. PRICE with secret instructions for opening, $1.50 ppd.

LOOK 35¢ LOOK Wonderful Instrument.

Greatest thing yet. Nine separate articles in one. Everybody delighted with it. Odd, Curious and interesting. Lots of pleasure as well as very useful. It is a double Microscope for examining the wonders of nature. It is also an Opera Glass, a Stereoscope, a Burning Lens, a Reading Glass, a Telescope, a Compass, a pocket Mirror, and a Laryngoscope—for examining eye, ear, nose and throat. It is worth all the cost to locate even one painful cinder in the eye. Folds flat and fits the pocket. Something great—you need one. Don't miss it. Sent by mail. Only 35c or 3 for $1.00

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Send at once and have all the FUN before everybody has one

PRICE POSTPAID 25c

DANDY PERISCOPE

A VERY INTERESTING AND AMUSING NOVELTY

SEE WITHOUT BEING SEEN

Look Over the Heads of the Tallest Men in a Crowd.

SEE OVER A FENCE, AROUND CORNERS, Etc.

This is the same kind of instrument that the soldiers use in the trenches to watch the enemy without risk of being seen themselves, and every submarine has one to project above the surface of the water to keep a lookout for other vessels, etc. With it you can gaze over a high wall or see around a corner without being seen yourself, or, if you are in a crowd, you can look right over the heads of the tallest men and watch all the fun. Our illustrations will give you some idea as to the numerous uses to which the Periscope can be put. Every Boy Scout should have one for spying and anyone else who wants some rare amusement. The Dandy Periscope is very strongly made, will stand the roughest handling and the hardest wear, and with ordinary use should last a lifetime. It measures 17 inches long, and a little over two inches wide. The Periscope Tube is handsomely decorated with colored designs to show many of its uses.

Price Postpaid to any Address.. $1.00

JOHNSON SMITH & CO., Dept. 990 RACINE, WIS.

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Dept. 990 RACINE, WIS.

A De Luxe Edition of our new CATALOG mailed on receipt of 25c. Handsome binding. Bigger and better than ever. Only book of its kind in existence. Nearly 6000 pages of all the latest tricks in magic, the newest novelties, puzzles, games, sporting goods, rubber stamps, unusual and interesting books, curiosities in seeds and plants, etc., unprocurable elsewhere. Remit by Coin, Money Order, Check or unused U. S., Canadian and Foreign Stamps for all articles listed above.

We also publish a large 750 page catalog of gift goods, diamonds, watches, jewelry, silverware, high grade furniture, etc., considered the finest catalog ever put out. The art work and color pages are superb and unsurpassable. To eliminate the merely curious we are compelled to ask for a deposit of $1.00, which is less than one fifth the actual cost of the book. This deposit may be deducted from any subsequent order for merchandise selected from this catalog.

BOYS! BOYS! BOYS!

Throw Your Voice

Into a trunk, under the bed, under a table, back of the door, into a desk at school, or anywhere. You get lots of fun fooling the teacher, policemen, peddlers, and surprise and fool all your friends besides.

THE VENTRILO

is a little instrument that fits in the mouth out of sight. Cannot be detected. It is used in connection with the above, and with the aid of this wonderful **DOUBLE THROAT**, or **VENTRILO**, you can imitate many kinds of birds, animals, etc. Remember you get everything for **ONLY TEN CENTS**—a booklet giving you full instructions how to become a ventriloquist and throw your voice, the **Double Throat**, or **Ventrilo**, and our big page catalog of novelties, tricks, puzzles, jokes, books, etc., **ALL SENT POSTPAID TO ANY ADDRESS FOR ONLY 10 cents**

J. S. & Co.

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This well made and effective pistol is modelled on the pattern of the latest type of Revolver, the appearance of which alone is enough to scare a burglar, whilst, when loaded, it will probably prove just as effective as a revolver with real bullets without the danger to life. It takes the standard .22 Calibre Blank Cartridges, that are obtainable most everywhere. **Special cash with order offer:** 1 superior quality Blank Cartridge Pistol, **100** Blank Cartridges, and our new **550**-page DeLuxe Catalog of latest novelties all for **ONLY $1.50**. Shipped by express only. Cannot go by parcel post. Extra Blank Cartridges **50c** per **100**. Remember it is quite harmless, as it will not accommodate loaded cartridges. Special Holster (Cowboy Type) for pistol **50c**. No C. O. D. Shipments.

Special Offer 1 Blank Cartridge Pistol, 100 Blank Cartridges, 1,550-page Novelty Catalog **ONLY $1.50** The Lot Shipped by Express Only Cash with Order Only

Johnson Smith & Co.

MAGICIAN'S BOX OF TRICKS

Apparatus and Directions for a Number of Mysterious Tricks, Enough for an Entire Evening's Entertainment..... $1.00

ANYONE CAN DO THEM

It is great fun mystifying your friends. Get this Conjurer's Cabinet, and you will be the cleverest fellow in your district. It contains the apparatus for ten first-class tricks, including The MAGIC BALL AND VASE TRICK (a wooden ball is placed inside, and upon replacing the lid has disappeared and is found in someone else's pocket); The HINDOO TRICK CARDS (can be made to change completely no less than five times); DISAPPEARING COIN BOX (a coin, placed in the wooden box, vanishes entirely or changes into a coin of another denomination); The GLASS GOBLET TRICK (a coin is dropped into a glass of water and when the water is poured out the coin has vanished and is found somewhere else); the RIBBON FACTORY FROM THE MOUTH TRICK (a seemingly endless supply of colored paper ribbons comes out of your mouth); the DISAPPEARING HANDKERCHIEF (a handkerchief held in the hand mysteriously vanishes); the WIZARD'S RING COIN TRICK; the ENCHANTED BOTTLE (no one but yourself is able to make it lay down); the GREAT HAT AND DICE TRICK (a large dice is placed on top of a hat, disappears, and is found underneath yet one has touched the hat), and last, but not least, the GREAT PHANTOM CARD TRICK, or two from five leaves nothing. Full instructions are sent for performing each trick. In addition to the above, a number of other feats and illusions are fully explained for which you can easily make or procure the necessary apparatus. **Price complete $1.00 postpaid.** JOHNSON SMITH & CO.

U. S. BABY TANK

25 Cents

It goes with real Yankee Pep—by its own power

Most remarkable toy ever invented. By drawing the Tank backward, either with the hand or over the floor or table and then placing it down, it will crawl along, overcoming all obstacles, in the same life-like manner as the larger Tank that proved so deadly in the great war. What makes it go is somewhat of a mystery, for there is no mechanism to wind up as is usually understood with mechanical toys, yet this tank will keep plodding along ten times longer than the ordinary run of toys. It will perform dozens of the most wonderful stunts; 2½ inches long. **Price only 25c prepaid. Stamps accepted.** JOHNSON SMITH & CO., Dep. 990 Racine

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Great curiosity. Place in water, plant opens up and starts to grow in few minutes. Taken out it dries up and goes to sleep until put in water again. **PRICE 10c., 3 for 25c. 75c per dozen, postpaid**

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A First Class Writing Machine For $1.50

A perfect little typewriter for $1.50. There are thousands of persons who would like to use a typewriter but whose needs and business do not warrant the expense attached to the purchase and use of a fifty or seventy-five dollar machine. To such persons we confidently recommend our Little Giant. It is strongly made, but simple in construction, so that anyone can quickly learn to operate it, and write as rapidly as they would with pen and ink. The letters of the alphabet most frequently used are so grouped as to enable one to write rapidly, the numerals 1 to 10, and the punctuation marks being together. With this machine you can send your best girl typewritten love letters, address envelopes, make out bills, and do almost any kind of work not requiring a large, expensive machine. **Price complete $1.50 by mail postpaid to any address in the world.** *Stamps accepted.*

250 MAGIC TRICKS 10c

For Parlor or Stage

An excellent little book containing nearly 300 Tricks for parlor or stage. Tricks with cards, coins, handkerchiefs, eggs, rings, glasses, flowers, thimbles, spoons, bottles, string. Explains the mystery of the floating head, and scores of other amazing feats of magic and illusions. Also Second Sight, Shadowgraphy, etc. So simple a child can perform them. Profusely illustrated. Sent postpaid for **ONLY 10c., 3 copies for 25c.**

125 CARD TRICKS and sleight of hand. Contains all the latest and best card tricks as performed by celebrated magicians, with exposure of card tricks used by professional gamblers. **Price 25c postpaid.** JOHNSON SMITH & CO., Dept. 990 Racine, Wis.

RAPID CIGARETTE MAKER

ROLL YOUR OWN SAVE MONEY

With this AUTOMATIC CIGARETTE MAKER you can make your own cigarettes from your favorite brand of tobacco and save money besides. It takes but a few seconds. Better cigarettes at about one fourth the cost. Simplicity itself to use. It is neat, useful and handy. Pocket size, weighs but half an ounce. Case is made entirely of metal, nickel plated. Full printed instructions with each Cigarette Maker. Pays for itself in no time at all. **PRICE ONLY 25 CENTS POSTPAID. 3 for 65 cents; or 1 dozen for $2.25 postpaid**

Send remittance (Postage Stamps accepted) for all articles listed above, also in our other ad on previous page

JOHNSON SMITH & CO. Dept. 990 Racine, Wis.

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for MEN and WOMEN
Age Range, 18 to 50
INSIDE or OUTSIDE WORK—LOCAL or TRAVELING

OVER 900 DIFFERENT KINDS of POSITIONS AVAILABLE

Gov't Positions are not affected by hard times, strikes, politics, etc. You can draw twelve months' pay every year and have a liberal vacation with pay. No more worry about the depression when you work for Uncle Sam. Check the position you want below—it belongs to you just as much as to anyone else. It is your own fault if you do not get it. Fill out and mail the coupon today! And full particulars will be sent you at once.

SPECIAL AGENTS
(Investigators) Start $200 Month
Government Secret Service Work is one of the most fascinating branches of the Service. These positions located throughout the country are both traveling and stationary. Salaries up to $5,000 yearly, and all traveling expenses paid while on the road.

OUTDOOR POSITIONS
Ideal, healthy, fascinating employment, where you can enjoy the forests, plains, and mountain trails, sunshine, and pure air. Duties are patrolling our borders, delivering mail on rural routes, and in cities and towns, etc.

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$1,400 to $3,000 Year
The Rural Mail Carrier has easy, healthy outside work, short hours, with a large part of the day left to do as he pleases. Thousands of city positions for those who prefer inside work, delivering mail in office buildings. These positions open to both country and city people.

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$1,500 to $1,860 Year and Up
This is interesting work. Farmers, butchers, or anyone with a knowledge of live stock, food products, meats, etc., are in line for one of these positions. Salaries and promotions splendid. Both men and women are eligible.

RAILWAY MAIL CLERK
$1,850 to $2,700 Year
These positions are both traveling and stationary. When traveling you receive an extra allowance when away from home more than ten hours; and when you grow old you are retired with a comfortable pension for the balance of your life.

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$2,100 Year to Start
The duties are to check and inspect goods brought into this country, levy the duties, etc., and see that Customs Regulations are not violated. This is very fascinating work, with splendid salaries.

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Send me immediately FREE full particulars about positions marked "X". Also your big list of other positions obtainable, salaries, locations, how to qualify, opportunities, etc.

Name.....
Address.....

ANDY'S SHOP MAIL BOX

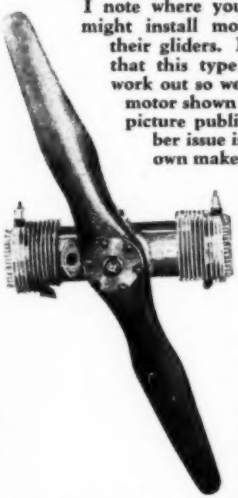
(Continued from page 28)

REMEMBER that power glider which headed my November column? Well, here's some more interesting dope on it:

29 E. 16th St.,
Covington, Ky.

Dear Friend Andy:

Just a line in regards to my glider photo in M.M. on page 12 of the November issue. I note where you tell the boys they might install motorcycle motors on their gliders. In answer I will say that this type of motor will not work out so well on all types. The motor shown on my glider in that picture published in the November issue is a special job of my own make and really keeps the glider in the air.



It is a three port two-cycle motor with a bore of 3⅞" and a 2½" stroke. The motor, complete with magneto, carburetor and prop, weighs only 33 lbs. Just weigh a motorcycle motor and see where it tips the scales and you will readily see that you cannot mount it as I have done.

The photo you have published is not complete, as there is a small streamlined gas tank which goes on near the cabane post, and two streamline flying wires from the wings on each side to small clips on the motor base, in addition to a throttle control.

I also have a twin under construction, a photo of which is enclosed (there it is up above).

I remain very truly,
JAMES F. SCHAFER.

Thank you for the additional dope, James. You seem to have a real nifty arrangement there.

I PULL A BONER

On page 64 of the December issue it appears that Lieutenant Stainforth's fastest lap in his speed trials was flown at 388.67 m.p.h. while his average time was 397.05 m.p.h. I wrote the article, so I'm to blame for this absurdity. I really shouldn't attempt to handle any figures as big as this, as I can't be depended upon to bring back the right change for a nickel. These figures, of course, should be reversed.

(Continued on page 36)

EXPO WATCH CAMERA

SEND ONLY $1

No bigger than a watch. Makes marvelous, sharp pictures 5/8"x7/8", that can be enlarged up to 3¼"x4¼". No focusing. Press the button and the picture is yours. "Time" and "Instantaneous" shutter. Loads in daylight. 20 exposure film costs only 30 cents. Send $1 for camera and film. Pay postman $4 plus postage. Money back guarantee. Send today.

NEW CENTRAL BAROMETER

Genuine aneroid construction. Forecasts the weather 12 to 24 hours in advance. Finely made. A precision instrument in every way. Should be in every home. 3½ inches in diameter. Only $2.95 for limited time. Send $1. Pay postman $1.95 plus postage.

SEND ONLY $1

Hawkeye 2A Only $9.95

With 2 Rolls of Film

This genuine Eastman Camera has very fine Double Rapid Rectilinear Lens. Makes pictures 2½x4¼ inches—so sharp and clear, they may be enlarged to most any size. Collect big *profit* on pictures of houses, pets, etc., made for friends. Act today and get a

FREE DEVELOPING AND PRINTING OUTFIT

During this offer you get 4 Trays, big supply of Developer and Fixer, Ruby Lamp, Stirring Rod, Graduate, 4 doz. sheets of Printing Paper, Printing Frame and FULL INSTRUCTIONS—all FREE! Satisfaction GUARANTEED. SEND ONLY $1. Pay postman $8.95 plus few cents postage when outfit arrives. Order now. Send $1 today.

PENCIL MICRO-SCOPE

ONLY $1

An excellent microscope magnifying 25 diameters yet is no larger than a fountain pen. For engineers, inspectors, custom-officers, jewelers, watchmakers, engravers. Also for botanists, zoologists, dentists, physicians, and students. Only $1 complete. Send today.

WOLLENSAK BIASCOPE

SIX POWER

SEND ONLY $1

For bird students, tourists and theatre goers. A very fine glass. Six power. Precision adjustments. Compensates for pupillary differences. Regularly $5. Special, with pingrain leather case, only $3.95. Send $1. Pay postman $2.95 plus postage. Satisfaction guaranteed.

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24 pages of photo and optical bargains. Foreign and domestic cameras and equipment. All illustrated, fully described, and offered on 10 day trial with a money back guarantee. Send today.

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ANDY'S SHOP MAIL BOX

(Continued from page 34)

Here's a letter from another bird who had his wings clipped:

8040 So. Perry St.,
Chicago, Ill.

Hello Andy Old Top:

How do you like my crate? (picture below) that took me 20 months to design and build, but when I got her on the line the bluecoats came and read me the law. Does she look Oke to you? (she sure does).

I am not an engineer and could not give them a stress analysis on her, so I took her apart without ever flying her and it is in the garage. I am waiting to hear what Alvia Peters has before I go any further. Then I will go to it. They can't lick us that easy, can they?

I used a Hart Aero conversion of a Chevvie, which gives 55 h.p. at 2500 r.p.m. with a 48" prop. It has built-in thrust bearings and full force oil feed through a drilled crankshaft.

So long,
CHARLES SCHLICHT.

Charles Schlicht poses with his caged eagle.

I SEE that I still have some room left, so I'm going to show you a few more light planes that have recently been completed by the gang. You fellows have been wanting a folding wing job that wouldn't fold up without authority from the pilot. I understand that Heath is now selling blueprints for such a job, but here's the first home-built plane of this type I've run across:

1420 Allegheny, St.
Atlanta, Ga.

Dear Andy:

Enclosed you will find a photo of my Heath Parasol (see page 38). I built this last year, had it test flown in July, and she flies nicely. It is the first light plane to be built in Atlanta that flies O. K. I would like to hear from all light plane fans.

Sincerely,
R. L. SLOCUM,

(Continued on page 38)

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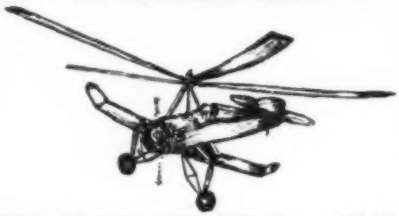

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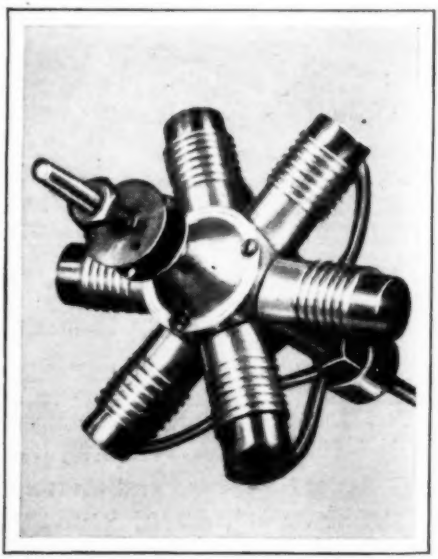
ANDY'S SHOP MAIL BOX

(Continued from page 36)

A Heath Parasol with wings folded back for storage and trailing. This job was built by R. L. Slocum of Atlanta from Heath plans.

For the Model Builders

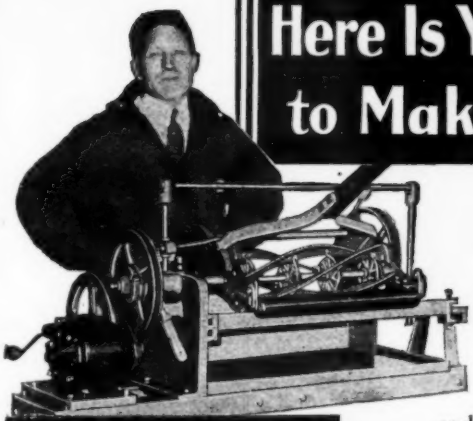
THE Miniature Aircraft Corporation, 83 Low Terrace, New Brighton, N. Y., has recently perfected a remarkable new 6-cylinder model airplane compressed air motor. Turning an 18" prop it develops 1/6 horsepower at 1700 revs a minute. It will fly a six-foot scale model plane for about one minute. Here's its portrait:



A six-cylinder compressed air model airplane motor which develops 1/6 horsepower at 1700 revs.

JUST a final tip to the gang from ol' Andy —look for a big surprise in next month's issue! You'll know what I'm talking about the minute you open the February number —until then, it's Andy's secret.

Here Is Your Opportunity to Make BIG MONEY



Be Independent! Have Your Own Cash Business

Sharpening lawn mowers by the Foley Electrakeen System gives you 99c CLEAR PROFIT out of every dollar you take in. It is a chance of a lifetime for you. Here's exactly the thing you've been looking for to make a clean-up this spring and summer, and have a well-established business of your own.

Start at Home in Spare Time

No high overhead expense in this fine-paying business. Set up your shop right at home, in the basement, attic, garage or workshop. NO PREVIOUS EXPERIENCE NECESSARY. After sharpening only a few mowers by following easy instructions, you can turn out perfect work.

SUCCESS!

$25 to $30 a Day

"Six years ago I bought a Foley Electrakeen Lawn Mower Sharpener, and mounted in on a small truck . . . . The first afternoon I took in $13.60. From then on, as I became more accustomed to the work, I earned $25 to $30 a day for the balance of the season . . ."

H. N. WOODMANCY.

* * * *

$10 Daily, First 6 Days

Received Lawn Mower Sharpener a week ago. I installed same on the back of my Ford coupe and use a small gasoline engine to operate it. I have averaged $10 a day for the 6 days that I have had it. I am very glad to have bought it. I live quite a long way from a city so my work is all among farmers.

J. GREEN.

* * * *

$42 to $150 a Week

We find no trouble at all in getting lawn mowers to sharpen, when we explain the advantages of the Electrakeen System. We have been in our new place of business about six weeks and our books show for the first week we did $45.00 worth of business; second week $42.25; third week $63.71; fourth week $64.50; fifth week $68.55; sixth week $69.13. As we are busy with lawn mower sharpening, I believe that the seventh week will give us an income of $150.00 or more, because we are so busy.

ANDREW WYMAN.

* * * *

$1520 in 5 Months

"I purchased one of your Foley Electrakeen Lawn Mower Sharpeners three years ago, and it is a money-maker. I intended to use the machine merely in my spare time. However, I found I was making $5 and $6 an evening, so decided to make it a full-time proposition. Last summer I made $1520 in five months . . ."

HENRY MORSE.

Foley Electrakeen Lawn Mower Sharpener

This remarkable machine **automatically** sharpens all kinds and sizes of lawn mowers by the same method used by leading lawn mower manufacturers. Does a perfect job in from 15 to 20 minutes, sharpening ALL blades and the cutter bar at the same time. You get $1.00 to $2.50 a job—$3 to $5 an hour, and most of it CLEAR PROFIT!

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Please send me FREE PLAN and complete information about how I can start my own business with the Foley Electrakeen Lawn Mower Sharpener.

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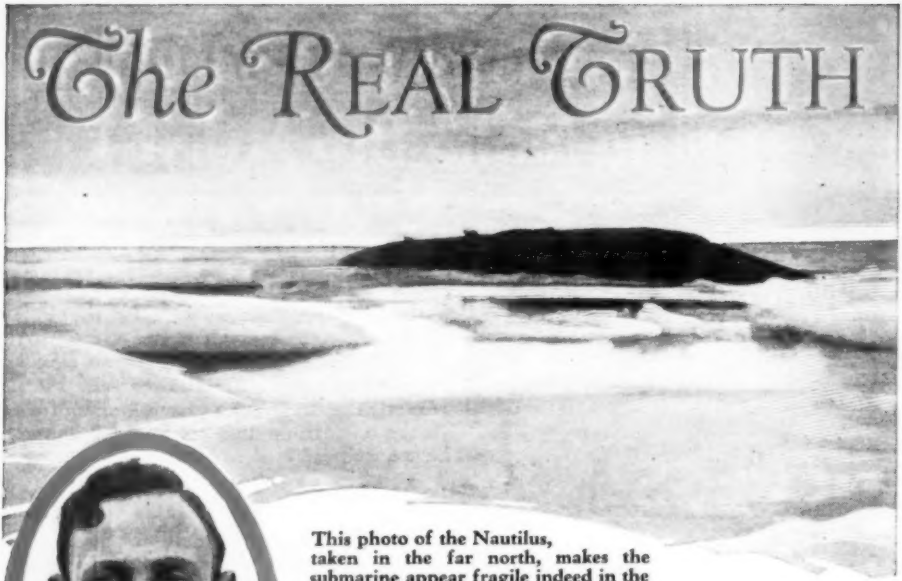
The REAL TRUTH



This photo of the Nautilus, taken in the far north, makes the submarine appear fragile indeed in the midst of grinding, desolate ice waste.

ARTHUR O. BLUMBURG

Mr. Blumburg has been for 15 years in the United States Navy submarine service, and was granted a leave of absence to lend his expert services to the Wilkins Polar Submarine Expedition. That Mr. Blumburg was one of the most valued members of the crew, is testified to by the following sentences taken from a letter written to the Secretary of the Navy by Commander Sloan Danenhower of the Nautilus: "Arthur O. Blumburg had charge of recommissioning the electrical department, the installation of the storage batteries and special gyro compass, the automatic pilot, and other electrical equipment. He accomplished this work with great dispatch and efficiency, and has been a faithful, zealous, and efficient head of the electrical department throughout the entire voyage."

by **ALFRED ALBELLI**

who interviewed ARTHUR O. BLUMBURG

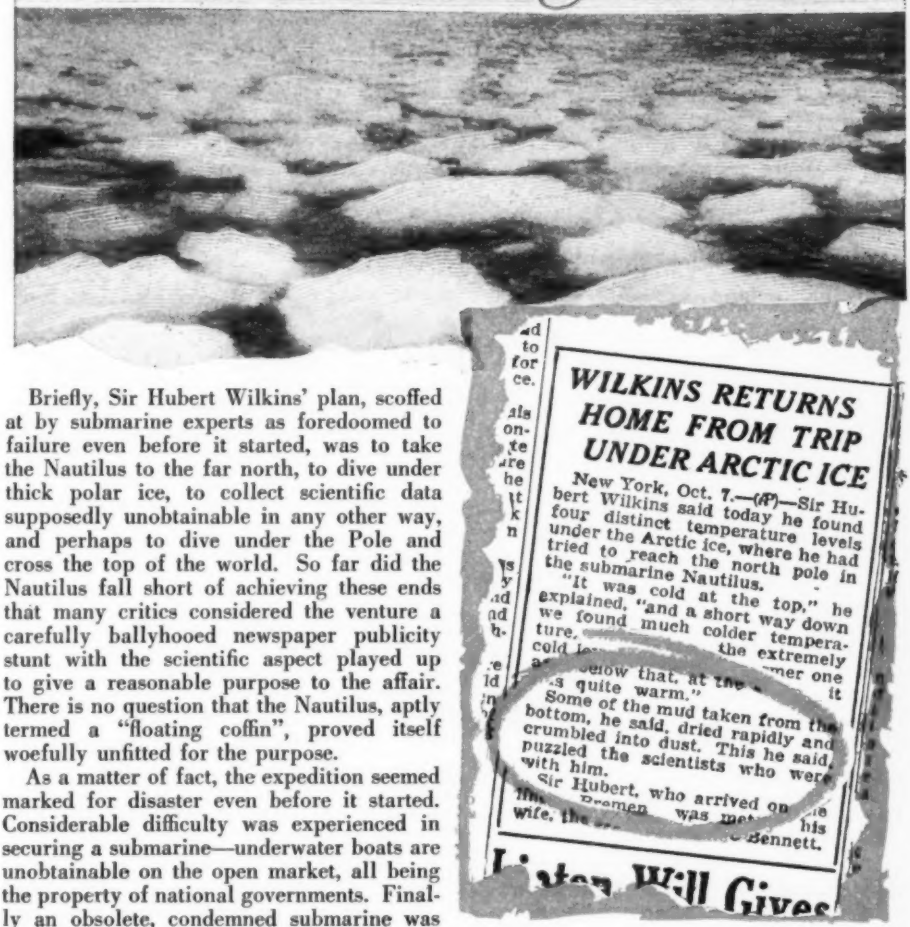
Chief Electrician's Mate of the Nautilus

The real story of the submarine Nautilus, which set out on a fantastic Jules Verne expedition to travel under ice to the North Pole, and which now lies abandoned in a European harbor after an amazing succession of catastrophes, is here told you for the first time by a member of the expedition. Fascinating, thrilling—an "inside" story—scientific adventure in the raw!

ALL the world has heard about the expedition to the North Pole in a submarine sponsored by Sir Hubert Wilkins, the famous explorer—all the world has read about the elaborate scientific equipment carried on the submarine Nautilus, about the mid-ocean breakdown of its motors, about the purpose of the venture in proving the feasibility of submarine navigation of the Arctic, and in collecting scientific data.

But the "inside" story of the expedition the world does not know. It has appeared in no newspaper, for reasons which will soon make themselves clear. To secure this story, MODERN MECHANICS AND INVENTIONS sent me to interview members of the expedition. I talked with several of them; they talked frankly to me. And I came away with the feeling that I had listened to the most amazing true story ever conceived by man, in which science and mechanics, as represented by a battered submarine, came off a bad second in its ambitious bout with the Ice King.

About the WILKINS POLAR SUB



WILKINS RETURNS HOME FROM TRIP UNDER ARCTIC ICE

New York, Oct. 7.—(AP)—Sir Hubert Wilkins said today he found four distinct temperature levels under the Arctic ice, where he had tried to reach the north pole in the submarine Nautilus.

"It was cold at the top," he explained, "and a short way down we found much colder temperature, the extremely cold [illegible] below that, at the [illegible] mer one [illegible] it was quite warm."

Some of the mud taken from the bottom, he said, dried rapidly and crumbled into dust. This he said, puzzled the scientists who were with him.

Sir Hubert, who arrived on the Bremen [illegible] his wife, the [illegible] Bennett.

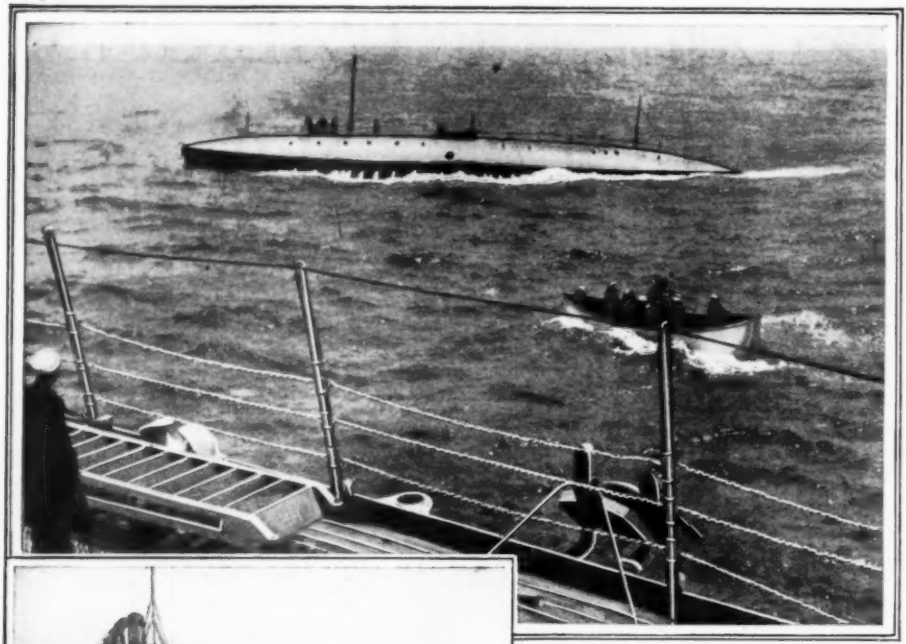
Most of the important scientific results of the expedition, supposedly undertaken in the interests of science, are summed up in the above clipping. The circled paragraph refers to a "scientific mystery" which was one of the high spots in the expedition's achievements.

Briefly, Sir Hubert Wilkins' plan, scoffed at by submarine experts as foredoomed to failure even before it started, was to take the Nautilus to the far north, to dive under thick polar ice, to collect scientific data supposedly unobtainable in any other way, and perhaps to dive under the Pole and cross the top of the world. So far did the Nautilus fall short of achieving these ends that many critics considered the venture a carefully ballyhooed newspaper publicity stunt with the scientific aspect played up to give a reasonable purpose to the affair. There is no question that the Nautilus, aptly termed a "floating coffin", proved itself woefully unfitted for the purpose.

As a matter of fact, the expedition seemed marked for disaster even before it started. Considerable difficulty was experienced in securing a submarine—underwater boats are unobtainable on the open market, all being the property of national governments. Finally an obsolete, condemned submarine was obtained from the U. S. Navy and revamped for polar work. During tests in New York harbor a member of the expedition, Willard Grimmer, quartermaster of the crew, was washed overboard and drowned. Late in getting started, the Nautilus crept across the Atlantic until one of its engines went out of commission, and was finally escorted into a European harbor where repairs were made. Then, late in the season—so late that the short summer season of the Arctic was almost over—the submarine crept north to keep its rendezvous with the icebergs.

An unforgettable climax, which will

"What the Nautilus Needs Is a Good Tow Rope" — Said Will Rogers



That there was more truth than jest in the cartoon shown at the left is proved by the above photo of the rescue of the Nautilus in mid-ocean by the U. S. S. Wyoming, after the sub's engines had collapsed.

Typical of the good-natured fun poked at the expedition by humorists is the above cartoon, reprinted from Judge, showing Sir Hubert vigorously "hitch hiking" a ride in mid-ocean for his disabled polar submarine, Nautilus.

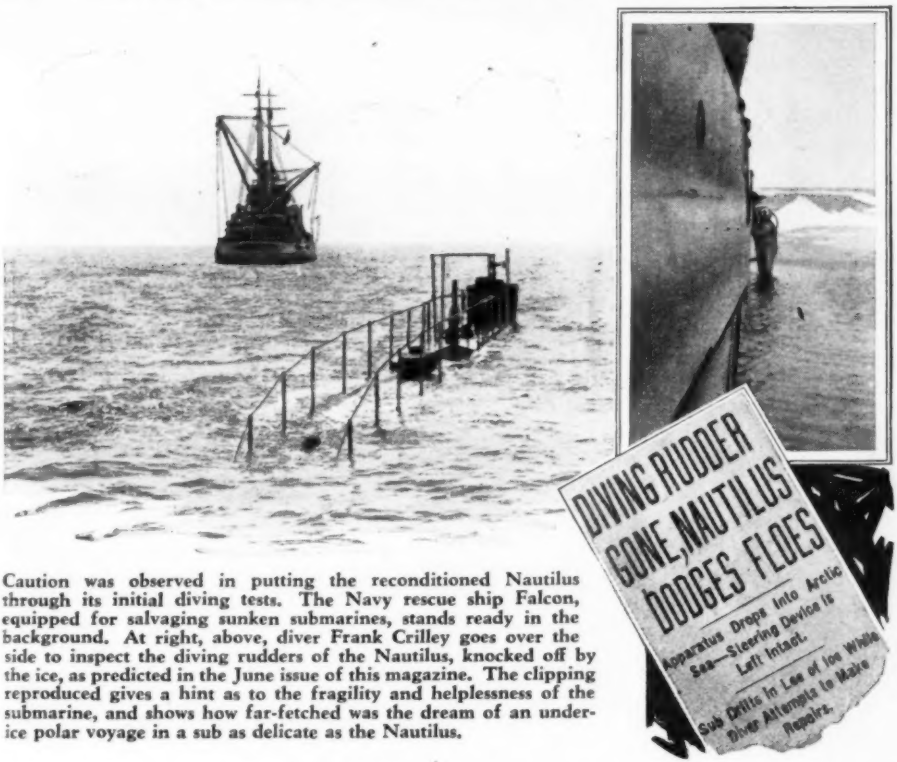
haunt the members of that Nautilus voyage to their last days, occurred when they returned to Spitzbergen after having spent from Aug. 3 to Sept. 10 in the Arctic. Sir Hubert Wilkins, the master mind of the undertaking, paid off his men at that point, though not in full, and then announced in a tone of desperation, "The expedition is broke!"

However, it was imperative that the Nautilus be returned to this country, as per his agreement with the United States Navy, from whom it was borrowed. A $20,000 bond had been posted to assure its return.

Thereupon Sir Hubert pleaded with his men to make the return voyage with him via Iceland and Nova Scotia. An open break then followed with Lieut. Commander Sloan Danenhower, commanding the Nautilus.

Commander Danenhower, one of the ablest authorities on submarine navigation in the world, prevailed upon Wilkins to abandon the idea as foolhardy and suicidal. The Nautilus could never stand up under the buffeting of the mammoth waves. Mutiny would have been the answer if Wilkins persisted, according to one member.

Some of the most amazing revelations of the Nautilus journey have come from Arthur O. Blumburg, chief electrician's mate on the submarine and one of the top-notch men in that branch of the service in the United States Navy. He was granted a year's leave of absence to go with the Nautilus.


DIVING RUDDER GONE, NAUTILUS DODGES FLOES
Apparatus Drops Into Arctic Sea—Steering Device Is Left Intact.
Sub Drifts in Lee of Ice While Diver Attempts to Make Repairs.

Caution was observed in putting the reconditioned Nautilus through its initial diving tests. The Navy rescue ship Falcon, equipped for salvaging sunken submarines, stands ready in the background. At right, above, diver Frank Crilley goes over the side to inspect the diving rudders of the Nautilus, knocked off by the ice, as predicted in the June issue of this magazine. The clipping reproduced gives a hint as to the fragility and helplessness of the submarine, and shows how far-fetched was the dream of an under-ice polar voyage in a sub as delicate as the Nautilus.

"Our worst plight was encountered during the Atlantic crossing," Mr. Blumburg told me. "We never expected to reach the other side alive. We had actually abandoned all hope.

"My job was to watch the huge gyro compass, which indicated the exact direction in which the Nautilus was heading. Well, after we left Provincetown on June 4, it seemed more like I was assigned to keep an eye on my ghost. I shall never forget the horrors of that voyage.

"I am going to tell you for the first time that every one on that boat was suffering from attacks of ptomaine poisoning. It was from the lead which got into the water. Only one or two escaped that illness. I was in bed myself for three days. I lost twelve pounds on that journey across.

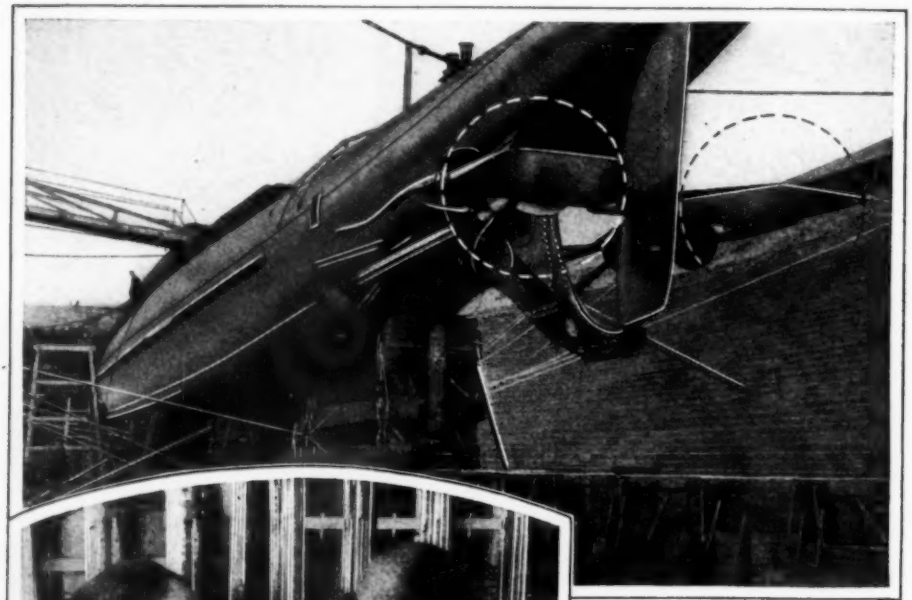
"Not only were we poisoned by the lead in the water which was from the tanks, but we also suffered poisoning effects from the tinned foods.

"Foremost, however, we had to put up with a handicap which might have been overcome at the start. Our ship was in a dilapidated condition. The Nautilus soon proved that it was no match for the high seas, to say nothing about the expectations hoped for in the Arctic.

"True enough we were never in precise peril of going to the bottom, but that might be attributed to the grace of God more than any ingenious foresight. As far as I could see, Wilkins knew nothing about manning a submarine. I had never known him to have been in a submarine in any official capacity prior to the Nautilus expedition.

"A good storm might have sent us down to Davy Jones or a leak would have meant quick dispatch to the never-never lands. And it wouldn't have taken anything very solid or bulky to have smacked us to end it all during that Atlantic cross. It was the frailest and most vulnerable craft I have ever been on.

"Above all I do not want to appear as unduly critical. It is far from my intention



Dotted lines encircle the diving rudders of the Nautilus, here shown in dry dock. These rudders were lost in the Arctic, apparently knocked off by ice cakes. This was an accident predicted by many submarine experts who scoffed at the idea of a North Pole voyage.

Sir Hubert Wilkins and Prof. Harold Sverdrup are shown testing the salinity of Arctic waters. So crammed was the submarine with apparatus that the men scarcely had room to turn around.

to censure unfairly. As one who has been in the United States Navy submarine service for fifteen years, I simply desire to enumerate my observations on that journey for the benefit of future expeditions. My views are strictly impersonal."

"You say the Nautilus was dilapidated. Just what mechanical troubles arose out of this condition?" I asked Mr. Blumburg.

"Our chief difficulties encountered during the crossing of the ocean dealt with electrical faults and mechanical defects," he explained. "The electrical trouble set in when the port motor went out of commission. On the mechanical side, the starboard motor went blooey. These failures caused her to pitch and roll dangerously.

"When we got to London these deficiencies were corrected. But there was another obstacle with which we had to contend helplessly. It might have meant the sacrifice of our lives. The ventilation system was outrageous. Why we didn't all perish from suffocation will remain a mystery to me forever. Somehow or other no one had thought of an adequate ventilation scheme, or at least they failed to foresee the uselessness of the one we had.

"The superlative touch of irony came, however, in the midst of our ocean crossing when our fates were in the hands of Neptune. I can't say just who was responsible for this monumental folly, but I do know and am convinced that its object was nothing more than publicity—headlines for the daily press which was capitalizing on our freak adventure.

Under-Ice Diving of the Nautilus Carefully Staged for Photographers

The Nautilus dived under polar ice only once, and that was for motion picture purposes, as shown.

Little provision was made for the effect of cold on the Nautilus. This photo shows how bolts were frosted and corroded by icy water.

"Here is the inside on the funniest piece of newspaper exploitation I have ever come upon: All of a sudden the radio message went out with the laconic but portentous tidings, 'Batteries Dead!'

"Such a notice signified only one thing—Disaster, for ship and everybody on her.

"As a matter of fact the batteries had not gone dead. This phase brought ill-feeling between the directors of the expedition and the Exide Battery Company. There were 60 tons of submarine batteries aboard, consisting of 120 cells. It was the first time that a submarine storage battery had been operated under temperatures that this one had been, and proved so successful. The battery temperature was often at 34 degrees."

Commander Danenhower and Sir Hubert Wilkins on the deck of the Nautilus. Danenhower prevailed upon Wilkins to abandon his idea of making the return voyage to America in the damaged submarine.

Recalling the article by Lew Holt in the June issue of MODERN MECHANICS AND INVENTIONS, in which the opinions of submarine experts were quoted to the effect that the ice-cutting drills with which the Nautilus was provided were unworkable and that most of the scientific equipment was fantastic, I asked Mr. Blumburg to enlighten readers of this magazine on those points.

"I would like to say something about the absurd appurtenances and stupid apparatus we carried on our boat," said Mr. Blumburg. "First of all, that specially-constructed diving compartment which they said was the invention of Simon Lake, the famous submarine inventor, might just as well have been a bouquet of roses for all the diving

(Continued on page 192)

Mirror and Steel Bars at Bank Window Prevent Holdups

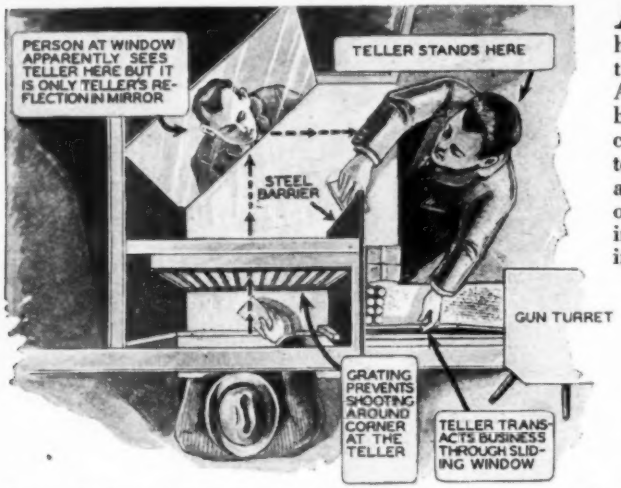

PERSON AT WINDOW APPARENTLY SEES TELLER HERE BUT IT IS ONLY TELLER'S REFLECTION IN MIRROR
TELLER STANDS HERE
STEEL BARRIER
GUN TURRET
GRATING PREVENTS SHOOTING AROUND CORNER AT THE TELLER
TELLER TRANSACTS BUSINESS THROUGH SLIDING WINDOW

Image of teller is reflected by mirror when dealing with patron, while bars and steel barrier prevent holdup. Note gun turret at the right.

A NEW and effective system to thwart bank robberies has been installed in the National Bank of Pico, near Los Angeles, California. When a bandit approaches a teller's cage, he apparently sees the teller in his usual place, but actually sees only a reflection of the teller in a mirror. For, in reality, the teller is standing several feet to the right, within easy reach of a gun turret.

The diagram at the left, looking from above, further explains how the system operates by means of a mirror at an angle of 45 degrees. In case a bandit attempts to shoot a teller who refuses to put his hands up, the bullets strike the mirror and not the man. Wide bars and a steel wall prevent a bandit who is "wise" to the system from shooting around the corner at the teller. Even at best, the bandit stands little chance of success, for the turret guns are trained on him.

Owing to the great number of bank holdups that have occurred in recent months, the system is expected to win wide acceptance among bankers, especially in rural sections.

Hand Rests Make Driving Easier

FATIGUE in driving is eliminated by a new hand rest attachable to any auto steering wheel. Weight of arms rests on the wheel while the fingers remain on the handles, permitting relaxation with perfect control at all times.

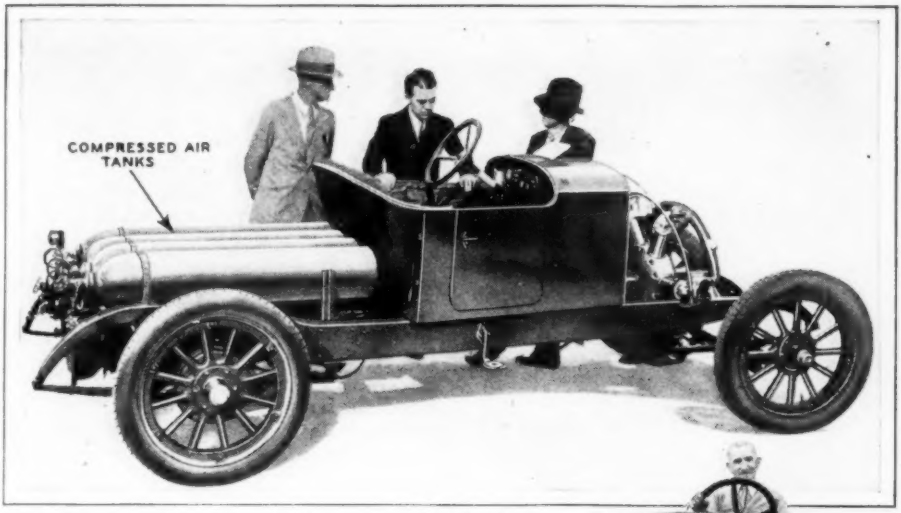
Motorist's fingers rest on adjustable handles on steering wheel to prevent driving fatigue.

Vender Sells Paper, Envelopes

STATIONERY is now obtainable by a coin placed in the slot of a new automatic vending machine. A nickel and a twist of a knob at the side delivers two sheets of paper and a stamped envelope, so that all you have to provide are the words and the writing pen. The machine, occupying only 8½ inches of counter space, has a damaskeen finish with modernistic effects.

Nickel in slot of vending machine delivers 2 sheets paper, stamped envelope.

Compressed AIR MOTOR Runs Car



A side view of the compressed air car, showing the four fuel tanks which will drive the car 500 miles at a speed of 35 miles an hour. The engine requires no cooling system, no ignition system, no carburetor, nor the hundreds of moving parts included in a standard gasoline motor.

EITHER the era of "free air" is about to come to an end, or the cost of motoring is about to be reduced to practically nothing. In an amazing demonstration conducted recently in Los Angeles a standard automobile chassis, powered with a newly-developed compressed air motor, whizzed around the city streets at not one cent of cost to the driver for fuel.

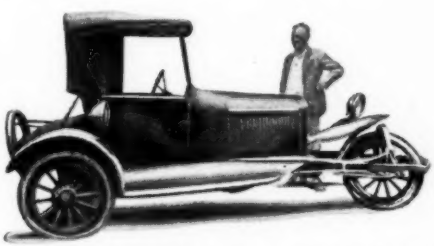
The engine, which is the result of six years of research by Roy J. Meyers, resembles in general appearance a radial airplane motor. It is mounted in an upright position in the same space occupied by a gasoline motor in standard cars.

A front view, showing how the compressed air engine is mounted. An electric heater, operated by a battery and generator, heats the air until it attains a pressure of 200 lbs. As the warm air goes through the engine and is cooled, it is recovered and drawn into a compressing chamber, where it is heated again and returned to the tank.

A Three-Wheeled Car for 60c

WITH a total cash outlay of only sixty cents, plus several hours of labor and a large amount of mechanical ingenuity, J. M. Custer of Piggott, Arkansas, has built for himself a most unusual three-wheeled flivver.

Made entirely of parts picked up from the junk pile, the car contains parts of seven different makes of autos. Steering is done with the front wheel, which is mounted like a wheelbarrow wheel, considerably ahead of the motor.



This unusual vehicle, built by J. M. Custer of Piggott, Ark., resembles a cross between a flivver and wheelbarrow. It was assembled from junk.

Inclined Electric Railway for Climbing Stairways in Home

Passenger ascends or descends on this new electric stair climber by pressing button on side. It relieves housewife fatigue and is suitable for invalids.

MINIATURE inclined railways have made their way into the home in the form of a device dubbed the electric stair climber. Suitable for installation in any home, the climber consists of a platform capable of carrying two people, and is especially handy for use by invalids. To ascend or descend the passenger simply sits down and pushes a button on the side, as demonstrated in the accompanying photograph.

Modern Man Best Domesticator

MODERN man is a better domesticator of animals than his caveman ancestors. Mankind now possesses no less than 39 domesticated animals. Of these only dogs, oxen, goats, pigs, horses, asses and perhaps some varieties of sheep and buffalo were domesticated by prehistoric men. Other mammals, such as two kinds of foxes, the skunk, the mink and the muskrat have been domesticated recently for the sake of their fur. Recent domestications include also the lion, bred for sale to zoos; the alligator, bred for its skin; and the fly maggots now bred in hospitals to treat bone diseases.

Cuts All Vegetable at One Slice

Whole tomato is cut at one stroke with new seven-blade slicer shown above.

BLADES of a new vegetable slicer are hinged and cutting action is in one motion, in an arc downward. A container beneath holds the juices. The seven curved, serrated blades are of stainless steel.

Suction Cup Shoes in Plane Stunt

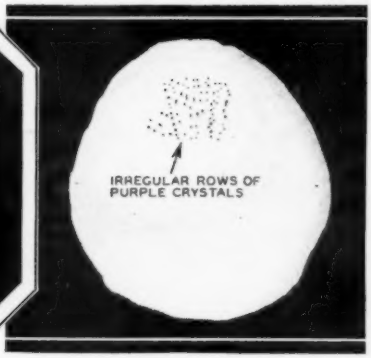
J. D. PATE, famous airplane stunt man, illustrates in the photo below his latest invention in the way of aviation thrill-makers. In performing his amazing stunt, Mr. Pate fastens a piece of plate glass on the top wing of an airplane. Then he dons a pair of special shoes which are equipped with suction rubbers on the soles, and stands on the glass. These rubber suckers anchor him firmly to the wing.

When the plane has attained considerable height, the pilot turns the plane upside down and Mr. Pate hangs suspended by his shoes from the wing.

J. D. Pate, airplane stunt man, demonstrating how his rubber suction cup shoes anchor him to wing of plane, which flies upside down in stunt.

Suicide or Murder? ~ Science Tells Which

The first paraffin cast taken from the suspected man's hand shows nothing.



After being treated with two reagents a cloud of blue crystals strings out into irregular purple rows as shown above.

Extremely minute particles of decomposed elements of the exploding powder blow back over the hand every time a revolver, pistol, or automatic is fired. These particles, coming from the points marked A, B, and C, settle on the area of the hand shown by the dotted lines on the photograph above. They are invisible to anything but microscopes of 5,000 diameters magnifying power, and even then are not certainly identifiable. With the process described here, however, they are picked up and identified at once. No hand gun has yet been invented which does not leave these traces on the hand that fired it, and soap and water will not remove this positive proof. If gloves are worn, they will retain the marks.

NO LONGER can a murderer defeat justice by placing the gun in the hand of the victim to mislead the coroner's jury into returning a verdict of suicide. On the other hand, it will no longer be possible for an innocent man to be convicted of murder on circumstantial evidence if the deceased fired the shot which ended his own life, for science can now identify positively the hand that fired the gun.

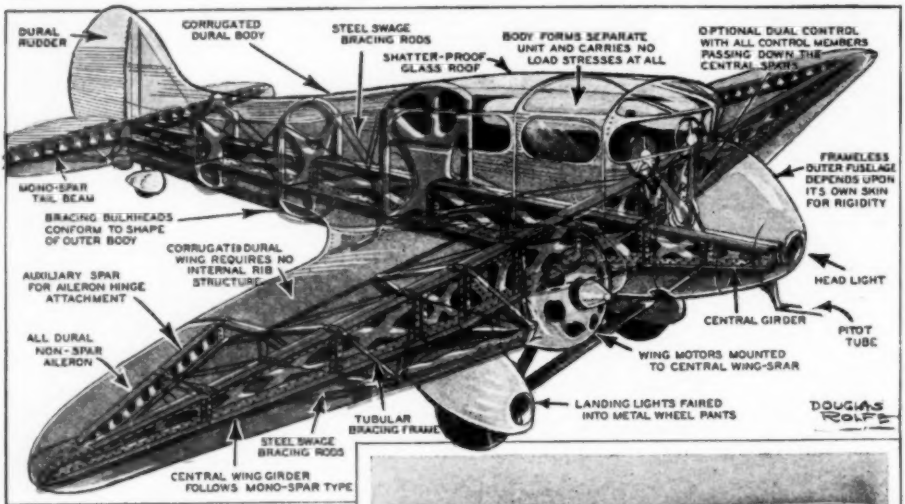
Whenever a firearm explodes, the generated gases expand and blow backward as well as forward. No firearm has yet been built in which some of these gases do not escape backward.

As these gases blow backward they carry with them ultra-microscopic particles of the burning powder with force enough to imbed them in the skin around the bases of the thumb and forefinger, as well as back along the wrist, of the hand that pulls the trigger.

These tiny particles of decomposed nitrates are invisible to the unaided eye. Indeed, there are very few microscopes which will reveal them with any certainty. But warm paraffin, placed over the skin, picks them up. Still, they are invisible, even against the dead white of the paraffin. But when the cast or mold is cooled and hardened, and Guttman's reagent poured into it, the ultra-microscopic particles swell and turn blue, forming a cloud-like mass of "dust".

The proof is not complete until the nitrate particles turn purple under Lunge's reagent, and stretch out into lines. Once this color and form appear it is known that the hand tested fired the fatal shot. If such "nitrate writing" does not appear on the hands of the victim the case passes from possible suicide to certain murder.

SINGLE SPAR WINGS


DURAL RUDDER
CORRUGATED DURAL BODY
STEEL SWAGE BRACING RODS
SHATTER-PROOF GLASS ROOF
BODY FORMS SEPARATE UNIT AND CARRIES NO LOAD STRESSES AT ALL
OPTIONAL DUAL CONTROL WITH ALL CONTROL MEMBERS PASSING DOWN THE CENTRAL SPAR
FRAMELESS OUTER FUSELAGE DEPENDS UPON ITS OWN SKIN FOR RIGIDITY
MONO-SPAR TAIL BEAM
BRACING BULKHEADS CONFORM TO SHAPE OF OUTER BODY
CORRUGATED DURAL WING REQUIRES NO INTERNAL RIB STRUCTURE
AUXILIARY SPAR FOR AILERON HINGE ATTACHMENT
HEAD LIGHT
CENTRAL GIRDER
PITOT TUBE
ALL DURAL NON-SPAR AILERON
WING MOTORS MOUNTED TO CENTRAL WING-SPAR
LANDING LIGHTS FAIRED INTO METAL WHEEL PANTS
TUBULAR BRACING FRAME
STEEL SWAGE BRACING RODS
CENTRAL WING GIRDER FOLLOWS MONO-SPAR TYPE
DOUGLAS ROLFE

The phantom drawing above shows how the single dural spar and central girder carry the entire load of the plane. Such construction would permit a 32% greater payload with the same wing and power loading. At the right is the present Fokker tri-motor transport now being widely used.

ONE of the greatest drawbacks to the airplane as an economical means of transportation is its relative inefficiency. Obviously anything which can be done to increase the pay-load of aircraft without sacrificing safety or performance is worthy of consideration, for the structural weight of any airplane forms a large part of its total load and a good deal of the motive power is expended in forcing non-pay load through the air.

The wings of an airplane form a large part of the structural weight and it is in this direction that the Mono-Spar principle of wing construction seems likely to effect startling improvements. Invented by a Mr. H. J. Steiger this new method of construction seems destined to reduce the weight of any wing surface in an amazing manner. Applied to a tri-motor Fokker the Mono-Spar wing weighs only 820 lbs. against 1,350 lbs. of the standard Fokker wing. This means that the use of the Mono-Spar wing system would increase the actual pay-load of the Fokker by something like 32 per cent.

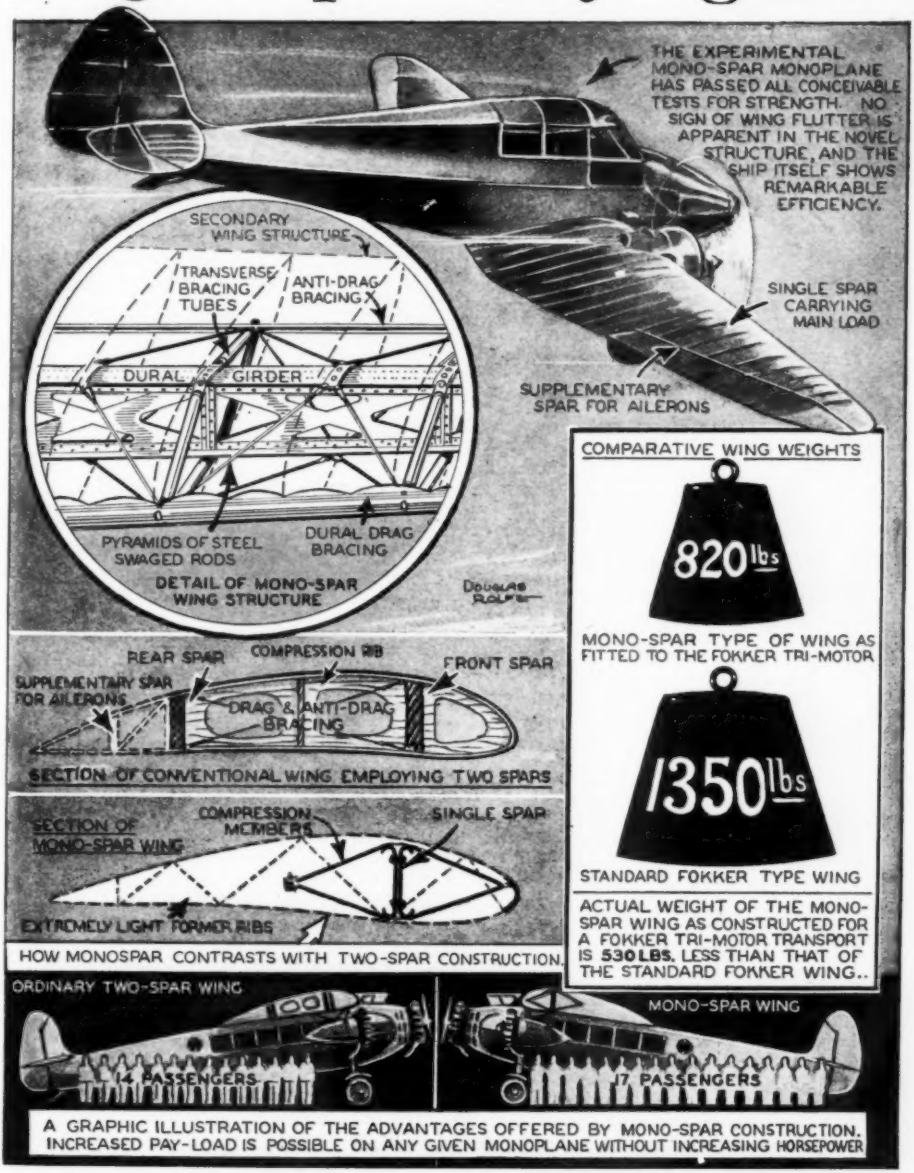
The idea of a single spar wing is not new. Most of the early monoplanes used wings in which the front spar took practically all the loads. Other planes have been built which frankly employed a single spar, but the difficulties encountered with "wing flutter" led to the abandonment of this form of construction and to the subsequent development of the rigidly-braced, box-like biplanes which followed the early monoplanes and for a time led the field.

Mr. Steiger's Mono-Spar wing involves a principle of construction which guarantees an absolutely rigid wing structure from a single rigidly-braced girder with flanges of special section which have been designed to permit the greatest strength. The whole spar is braced against torsion by two systems of helical bracing.

These bracing systems appear as pyramids of steel swaged rods which have their base at the spar.

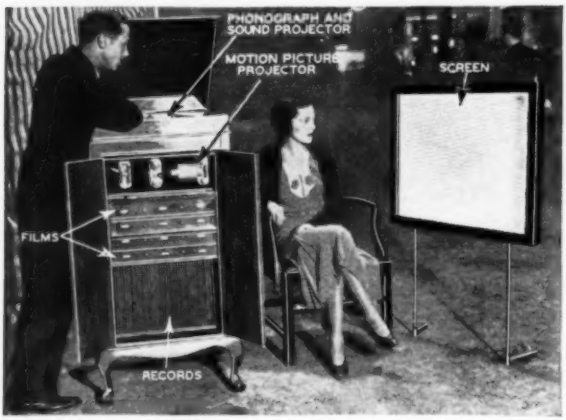
for Cheaper Flying

by DOUGLAS ROLFE


THE EXPERIMENTAL MONO-SPAR MONOPLANE HAS PASSED ALL CONCEIVABLE TESTS FOR STRENGTH. NO SIGN OF WING FLUTTER IS APPARENT IN THE NOVEL STRUCTURE, AND THE SHIP ITSELF SHOWS REMARKABLE EFFICIENCY.
SECONDARY WING STRUCTURE
TRANSVERSE BRACING TUBES
ANTI-DRAG BRACING
DURAL GIRDER
SINGLE SPAR CARRYING MAIN LOAD
SUPPLEMENTARY SPAR FOR AILERONS
PYRAMIDS OF STEEL SWAGED RODS
DURAL DRAG BRACING
DETAIL OF MONO-SPAR WING STRUCTURE
DOUGLAS ROLFE
REAR SPAR
COMPRESSION RIB
FRONT SPAR
SUPPLEMENTARY SPAR FOR AILERONS
DRAG & ANTI-DRAG BRACING
SECTION OF CONVENTIONAL WING EMPLOYING TWO SPARS
SECTION OF MONO-SPAR WING
COMPRESSION MEMBERS
SINGLE SPAR
EXTREMELY LIGHT FORMER RIBS
HOW MONOSPAR CONTRASTS WITH TWO-SPAR CONSTRUCTION.
COMPARATIVE WING WEIGHTS
820 lbs
MONO-SPAR TYPE OF WING AS FITTED TO THE FOKKER TRI-MOTOR
1350 lbs
STANDARD FOKKER TYPE WING
ACTUAL WEIGHT OF THE MONO-SPAR WING AS CONSTRUCTED FOR A FOKKER TRI-MOTOR TRANSPORT IS 530 LBS. LESS THAN THAT OF THE STANDARD FOKKER WING..
ORDINARY TWO-SPAR WING
14 PASSENGERS
MONO-SPAR WING
17 PASSENGERS
A GRAPHIC ILLUSTRATION OF THE ADVANTAGES OFFERED BY MONO-SPAR CONSTRUCTION. INCREASED PAY-LOAD IS POSSIBLE ON ANY GIVEN MONOPLANE WITHOUT INCREASING HORSEPOWER

The power required to draw a plane through the air at even moderate speeds is all out of proportion to that required by land and sea craft at practical speeds, especially if the passenger-horsepower ratio is considered. The Ford tri-motor, equipped with three 420 h. p. motors, is licensed to carry not more than 14 passengers in addition to the operating crew. The passenger-horsepower ratio in this case is approximately 100 horsepower per passenger. Mono-spar construction would allow 3 more passengers.

Phonograph, Radio, Recorder and Talkie in One Cabinet



Comprising radio, phonograph, voice recorder and movie projector, new "Synchrophone" has complete home entertainment.

ABOUT all you could want in the way of home entertainment is contained in a piece of apparatus exhibited recently at a radio show held in London, England. Known as the "Synchrophone", the set holds four means of entertainment—a radio receiver, a phonograph, a voice recorder and a movie projector with talkie equipment.

New Deadly Projectile

SAID to be the most destructive device ever inflicted on warring armies, a new projectile recently invented by British military engineers is receiving secret tests. Metal used in the shell is an alloy called nickel chrome molybdenum. In recent tests an antiquated dreadnaught was sunk.

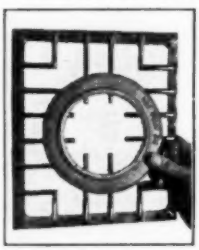
100 M.P.H. on Streamlined Trolley

AN ELECTRIC railway car, capable of a speed of 100 miles an hour, making it the fastest electric train in the world, was recently exhibited at the American Electric Railway Association Convention at Atlantic City, N. J.

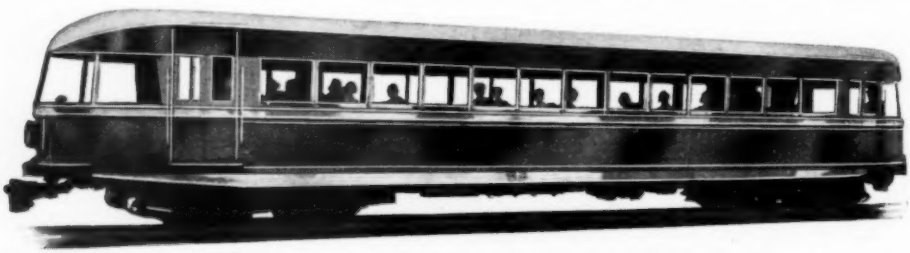
The outstanding feature of the car's construction is its streamlining. It was built by airplane designers and submitted to rigid wind tunnel tests to reduce wind resistance to an absolute minimum. Even the wheels are equipped with shields to cleave the air, and the roof is so designed that wind pressure holds the car to the rails when extremely high speeds are attained. Engineers are now endeavoring to perfect a noiseless fast street car with streamlined design for use in city streets. Thus noise of city thoroughfares will be reduced to a minimum.

Safety Gas Grates for Coffee Pots

NO LONGER need we worry about the coffee boiling over and putting out the gas fire and the accompanying danger of death, if the safety gas grate shown in the accompanying photo is used. This device consists of a raised flange in which there is inserted an asbestos gasket or ring that makes an absolute seat to the bottom of the cooking vessel setting thereon. If a pot boils over the water is deflected from the burner by the asbestos ring and then flows down beyond the outer edge of the burner.



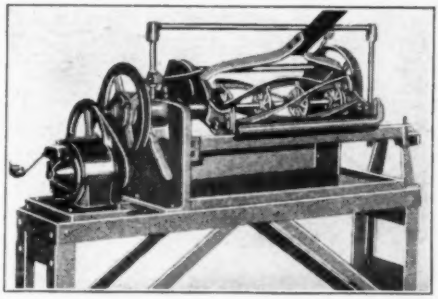
Flange on gas grate prevents flame going out when pot boils over.



This fastest electric railway train in the world, capable of a speed of 100 miles per hour, has streamline construction to reduce wind resistance to an absolute minimum at high speeds.

Sharpener Puts Razor Edge on Lawn Mower in 15 Minutes

A NEW whetting device now being marketed sharpens all kinds of hand and power lawn mowers by the same system as used by lawn mower manufacturers. No grinding wheels are used and blades are not removed. Simply detach one wheel, clamp the mower in the machine, make a few simple adjustments and start it going. It automatically sharpens the blades and cutter bar together. All the blades are brought to the same height so that each blade makes a perfect contact with the cutter bar over its entire length, assuring perfect cutting. The job is completed in 15 to 20 minutes.



This new sharpener, operating like factory sharpeners, automatically whets blades and cutter bar together, completing task in 15 to 20 minutes.

New Film Permits Taking Photos in Dark With Invisible Infra-Red Rays

INFRA RED RAY PROJECTOR
SLIDING PANEL TURNS ON INVISIBLE RAY AND STARTS CAMERA
ELECTRICALLY DRIVEN MOTION PICTURE CAMERA

Drawing demonstrates manner in which bandits may be photographed for identification with movie film sensitive to infra-red rays.

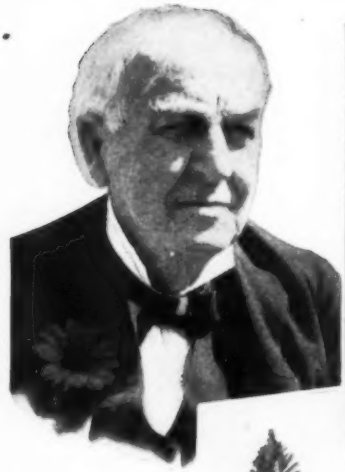
WHEN a group of fifty business and technical men, studying industrial research under the National Research Council's auspices, visited the Eastman Kodak Research Laboratories recently a picture of the gathering was made in pitch-black darkness.

The secret of the stunt was that the room was flooded with invisible infra-red light, and that it has recently become possible to sensitize film so greatly that a picture may be registered by invisible light in one second's exposure.

This new photographic material is already in use in observatories, where it permits the photography of stars three magnitudes smaller than could be previously recorded. It may conceivably be used in the future in banks for automatically photographing burglars in the dark without their knowledge. A secret movie photo of the bandit may be taken as illustrated in the drawing at left. With these photos in hand the police can easily identify thief for arrest and conviction.

This photo was made in complete darkness. Highly sensitized film recorded subjects, flooded with invisible infra-red rays.

Did THOMAS EDISON



The will of Thomas A. Edison, the world's greatest inventor, who died in mid-October, disposes of property estimated to be worth $12,000,000. It would seem impossible, then, that he could have died a comparatively poor man—yet this is the amazing conclusion of Remsen Crawford, Edison biographer and close friend of the inventor, who here presents proof in Edison's own handwriting which indicates the inventor was "property poor."

This photograph of Edison was taken on his 84th birthday, shortly before his death. In this article he reveals that his many patents never made a fortune for him, his income being derived mainly from his activities as manufacturer.

Edison's last experiment, that of extracting rubber from goldenrod, a 12-foot specimen of which is shown here, was crowned with success shortly before his death. His process is being developed.

AS THE last man in this world to have had a personal interview with Thomas A. Edison, I am going to set down here exclusively in MODERN MECHANICS AND INVENTIONS the reasons why that great wizard died a poor man. It seems most incredible that a man whose work was valued by Congress in 1928, when he was awarded the Congressional Gold Medal, at $15,599,000,000 should pass on from this earth as a poor man, comparatively speaking.

I am not writing for any dramatic flourish. I am stating plain facts, the same kind of facts which formed the basis of Mr. Edison's experiments. In my possession I have kept the handwriting of the genius of Menlo Park to substantiate what I am jotting down here. The proof is reproduced herewith from those originals.

Mr. Edison secretly expressed to me the hope that some day I would write just this kind of a story so that it might form a sort of guidance to inventors who would pick up the threads of science where he left off.

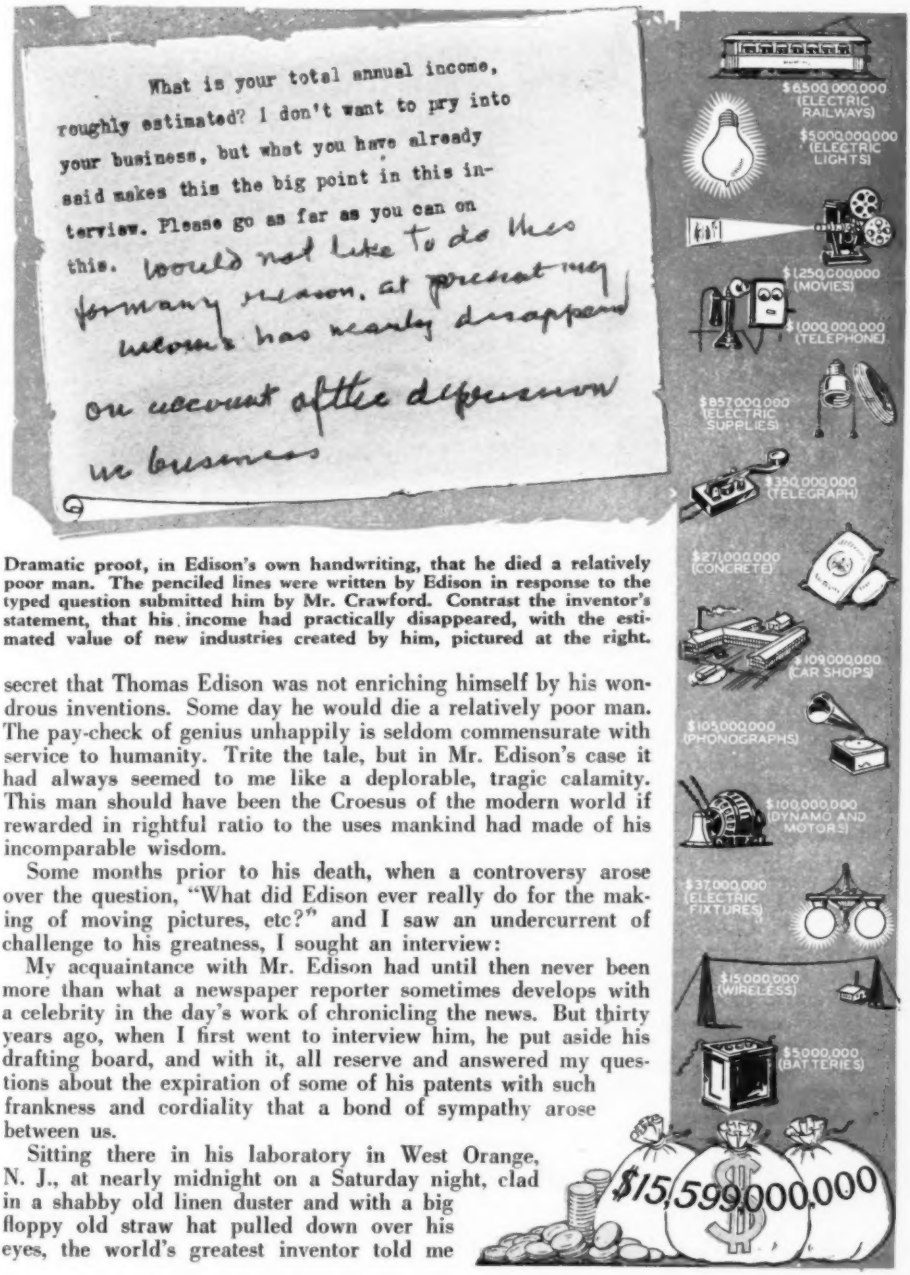
During our last meeting I distinctly remember how he placed his arm around my shoulder and said, "I have told you all. Be discreet. Do not tell everything until after I am gone. Then, after I have departed, you can do inventors and scientists a great duty by telling the rest."

I knew what he meant. That was the last time Mr. Edison ever spoke for publication. He never granted interviews. Mine was a rare good fortune. I had known him for many, many years.

And here is the story that I can now tell: For many years I had been let into the

Die a Poor Man?

by REMSEN CRAWFORD


What is your total annual income, roughly estimated? I don't want to pry into your business, but what you have already said makes this the big point in this interview. Please go as far as you can on this. I would not like to do this for many reason, at present my income has nearly disappeared on account of the depression in business
$6,500,000,000 (ELECTRIC RAILWAYS)
$5,000,000,000 (ELECTRIC LIGHTS)
$1,250,000,000 (MOVIES)
$1,000,000,000 (TELEPHONE)
$857,000,000 (ELECTRIC SUPPLIES)
$350,000,000 (TELEGRAPH)
$271,000,000 (CONCRETE)
$109,000,000 (CAR SHOPS)
$105,000,000 (PHONOGRAPHS)
$100,000,000 (DYNAMO AND MOTORS)
$37,000,000 (ELECTRIC FIXTURES)
$15,000,000 (WIRELESS)
$5,000,000 (BATTERIES)
$15,599,000,000

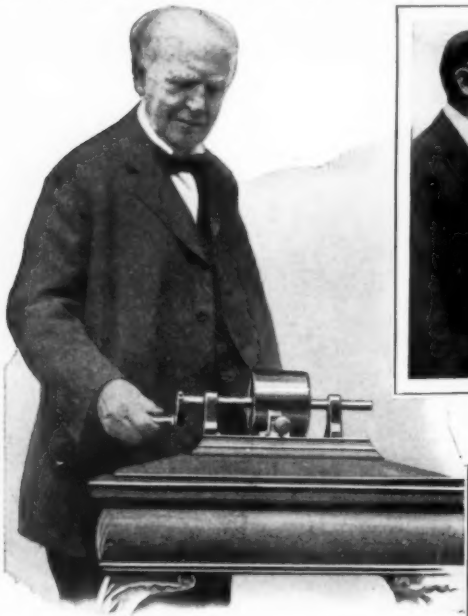
Dramatic proof, in Edison's own handwriting, that he died a relatively poor man. The penciled lines were written by Edison in response to the typed question submitted him by Mr. Crawford. Contrast the inventor's statement, that his income had practically disappeared, with the estimated value of new industries created by him, pictured at the right.

secret that Thomas Edison was not enriching himself by his wondrous inventions. Some day he would die a relatively poor man. The pay-check of genius unhappily is seldom commensurate with service to humanity. Trite the tale, but in Mr. Edison's case it had always seemed to me like a deplorable, tragic calamity. This man should have been the Croesus of the modern world if rewarded in rightful ratio to the uses mankind had made of his incomparable wisdom.

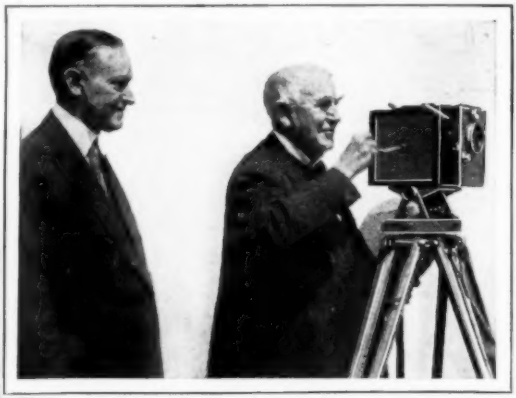
Some months prior to his death, when a controversy arose over the question, "What did Edison ever really do for the making of moving pictures, etc?" and I saw an undercurrent of challenge to his greatness, I sought an interview:

My acquaintance with Mr. Edison had until then never been more than what a newspaper reporter sometimes develops with a celebrity in the day's work of chronicling the news. But thirty years ago, when I first went to interview him, he put aside his drafting board, and with it, all reserve and answered my questions about the expiration of some of his patents with such frankness and cordiality that a bond of sympathy arose between us.

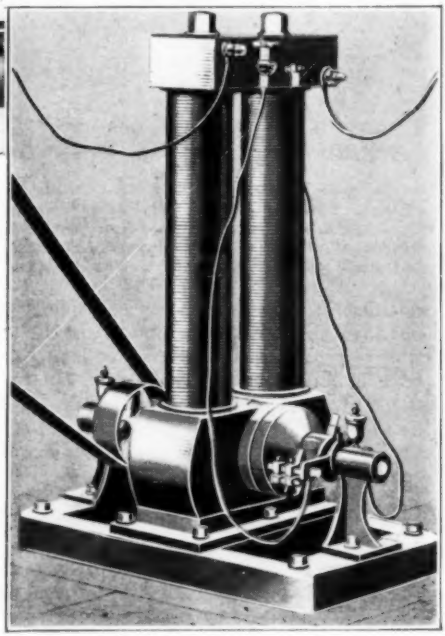
Sitting there in his laboratory in West Orange, N. J., at nearly midnight on a Saturday night, clad in a shabby old linen duster and with a big floppy old straw hat pulled down over his eyes, the world's greatest inventor told me



Edison turning the handle of his first phonograph on the fiftieth anniversary of its invention. It was one of his earliest successful inventions.



Movies, which he invented, were a favorite recreation of Edison's. Here he poses with Coolidge.



Here's a photo of Edison's first crude dynamo.

that he had never had exclusive use of any of his great inventions.

He related to me that while a government is supposed to protect a patent for seventeen years, the expiration of a patent means but little to an inventor because in the case of an epoch-making invention, nine times out of ten somebody has bobbed up and challenged the real inventor's right to his patent, and the real inventor always gets the worst of it in court, even though he may hold in his hand the patent of the United States Government.

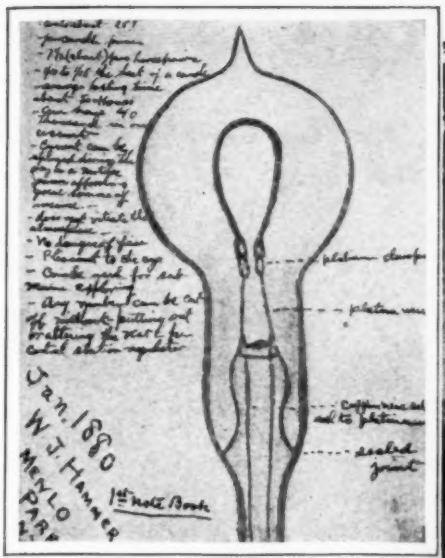
"Take that little incandescent lamp hanging over my head, for instance," declared Mr. Edison in that interview years ago and which I am now releasing in its entirety for the first time. "I fought for that in the courts of this country fourteen years, and my associates and I spent $1,000,000 trying to establish my claims to it which had been vouched by the Patent Office.

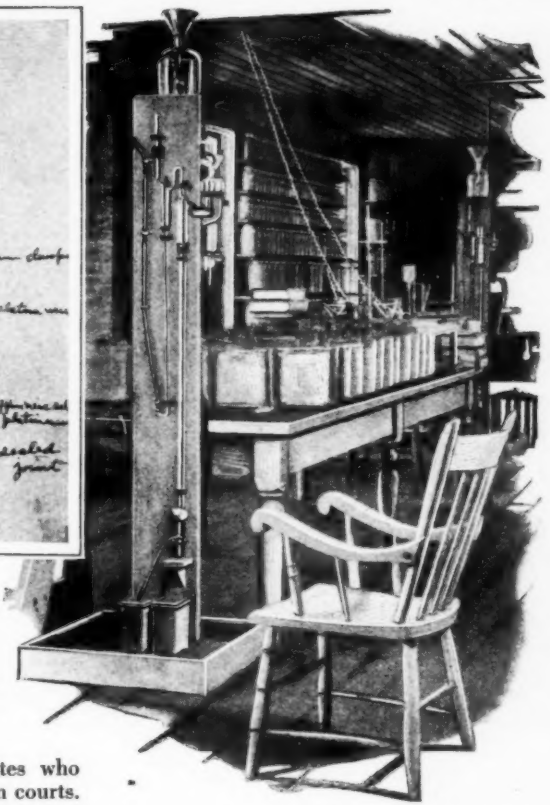
"At the expiration of the fourteen years there were but three years left for the patent to live.

"Thus, my opponents were able to keep me out of the profits of that particular patent until the rights to it were well-nigh useless.

"I am not saying this in a mood of complaint, for I can make money, anyhow. But it is a miserable system we have in this country that menaces a poor man starting out to invent something. I know of several inventors who are poor. Their ideas would have made them millionaires. But

Edison Forced to Fight 14 Years to Protect His Patent on Electric Lights





Page out of Edison's notebook, sketching the design of the first electric lamp, which was Edison's own favorite invention. At the right, Edison's laboratory with the apparatus used in creating the first incandescent lamp in the foreground. The chair in which he sat stands empty—will there ever be as great a genius to occupy it?

they were kept poor by the pirates who were allowed to usurp their rights in courts.

"The usurpation is particularly apt to result in the case of some extraordinary patent. I could invent a new monkey wrench which might go without infringement, but the moment I take certain forces and work out a moving picture for the first time in the history of the world, like that produced by the kinetoscope, mark you how the pirates rise up and call it their own.

"The seven patents expiring at midnight tonight are not fundamental patents. They were improvements rather than originations. The monopoly of their use will not be destroyed for the reason that there is no such thing in this country as the monopoly of any inventor's creation.

"We have never had a monopoly of anything I have ever invented."

With this old interview in my mind, I wondered how Mr. Edison had been faring all these years with "the pirates" whom he had so vividly, so forcefully depicted to me long before.

On my last visit to Mr. Edison not so long ago, I found him in his laboratory peering through a queer new camera. He chuckled good-humoredly as he hailed me with this:

"Yes, we'll take up where we left off thirty years ago, and we'll complete the interview about the fellows I call 'pirates'. Maybe it will help those young inventors who are coming after me."

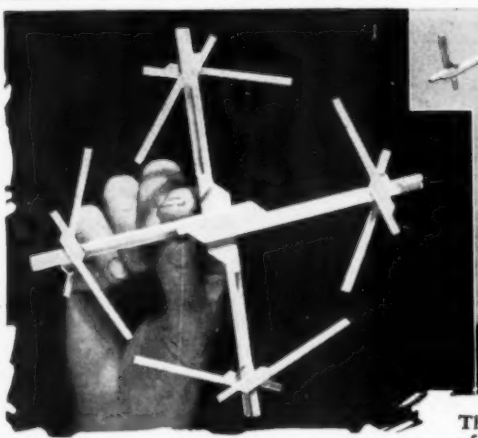
He spoke very frankly to me about his financial status when I asked him if he would take me into his confidence and tell me why he was not the richest man in the world.

Here is the first question I typed out for Mr. Edison, for this was the form our interview took:

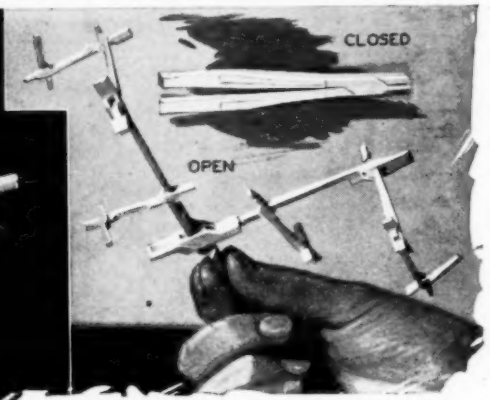
"In our interview Friday you answered one of my questions by saying that you had never made much money from your inventions and patents but your earnings had

(Continued on page 177)

Eleven Tiny Pliers Carved From Small Stick of Basswood



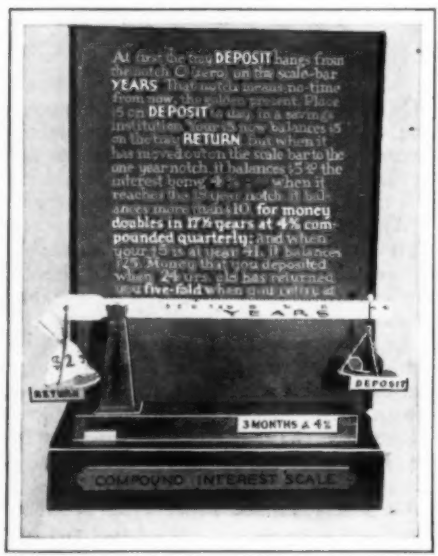
Delicate work that can be performed with carving knife is shown in this array of wooden pliers.



This job was carved entirely from a single piece of basswood, of the size shown in closed position

Scale Shows Interest Thru Years

A WINDOW display scale which measures for you your financial age and teaches personal economics was recently patented. The purpose of the scale, shown below, is to demonstrate the power of interest in raising financial age to physical age in accordance with a savings plan.



What compounded interest on savings will amount to in years is demonstrated on this novel scale.

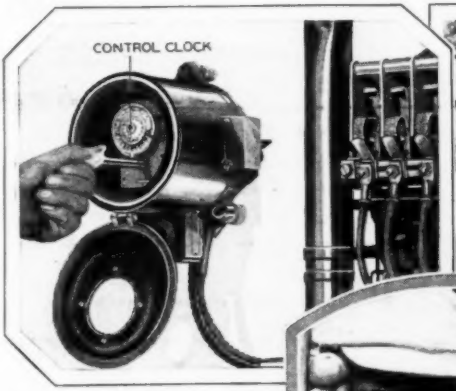
WHAT may be done in the way of delicate woodworking is disclosed in the creations of a Nebraska craftsman, who conducts a "Museum of Wood". Probably the finest product of his workbench is an array of tiny pliers all carved from one piece of basswood. When closed the contrivance has the appearance of a simple, unpretentious stick of wood, but with a little manipulation of the fingers it unfolds into a number of tiny pliers, as illustrated in the photos above.

Flower Urn From Scrap Parts

THERE is apparently no end to the practical and clever things which can be done with the welding and cutting torch. The little blue flame wins first prize as a transformer of old things into new, and things which are practical, useful and ornamental.

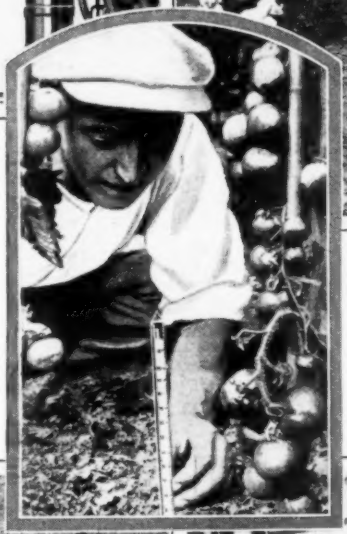
Twelve inches of the end of an old heater tank; an old automobile differential housing and sleeve, with two pieces of strap iron were welded together to make this novel flower urn.

Electricity Heats Soil for Bigger Harvest



This electric control clock, the automatic brain of the new system, turns the electric current on and off to the greenhouse. In winter current stays on 16 hours a day.

From the photos above you can get an idea of the superiority of the electrical over the natural method. Plants growing in electrically heated ground are several times size of others of same age left untreated in pots. Plants in the earth are larger and more productive than potted plants.



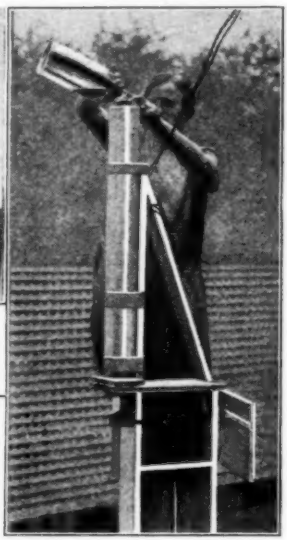
Karl Birkigt, Germany's pioneer in electrical gardening, checking the temperature of the electrically heated ground in his greenhouse near Chemnitz, Germany. Since Christmas night, 1930, he has had five harvests.

Here is a workman laying the electrical cable which forms the heating element of the scheme. The wire is buried under six inches of soil and is said to increase yield fivefold. The other side of the circuit is grounded so that contact with the earth causes cable to heat up.

Phenomenal growth of these tomato plants was due to the application of electrical heat to the greenhouse soil. Yield of tomatoes from these plants was exceptionally large, proving the experiment an indubitable success. Compare these plants with natural-size tomato plants of your own garden.

SCIENCE *Solves the Secrets*

Government apiculturist observing working life of bees in glass observation hive through microscope.



Filling the syrup can to lure the bees. This spot is a favorite hangout and a clock automatically records the time when the bees start flying in the morning and when they stop late in the afternoon.

Honeybees get sick like anybody else. Top photo shows laboratory where diseases are studied. Below—Self-recording instrument which makes graph showing hours during which bees search for honey.

MANKIND has learned much in ferreting out the mysterious secrets of the interesting and useful honey bee. Science points out that bees are actually able to equip their hives with "automatic furnaces," showing an ability to handle the problem of properly regulated heat as well as humans; that bees sometimes become cannibalistic; that honey can be used as an anti-freeze solution; and that an army of bees can actually hold up railroad traffic for an entire day.

By means of ingenious devices, scientists of the U. S. Department of Agriculture, working at the government bee culture laboratory at Somerset, Md., have contributed their share to the new fund of bee knowledge. To determine just how busy the busy honey bee might be and when and why was the object of the latest investigation by the government apiculturists.

After many trials with various kinds of devices to count the bees, a "gate" was devised through which but one bee could pass at a time. In passing in or out of the gate, of which there were a large number to each hive, the weight of the bee caused an electrical contact to be made which operated a recording mechanism in the laboratory, enabling scientists to record continuously the ebb and flow of hive operations.

It was learned that of the 2,434,666 bees

of the Busy HONEY BEE

Above—Scientist photographing the brood produced by queen bee, to determine prolificness of the hive. Center photo shows bee at work gathering honey. Bees produce 8/10 gram of honey during lifetime.

which left the hive 3.16 per cent did not return. This would mean that on an average a bee makes about 31.65 trips before death overtakes it. A bee may make a trip lasting anywhere from 8 minutes to an hour and 54 minutes, depending on the honey flow.

It seemed also to the government experts, on the basis of the figures, that the fame of the "busy bee" must rest upon her appearance of busyness only and not on the size of the pile of honey she leaves for her heirs. Her lifetime accumulation of nectar amounts to but 800 milligrams, or eight-tenths of a gram. At this rate of production it would require the work of 567 bees for a lifetime to produce a single pound of nectar.

Who would ever suspect that honey might be employed as an anti-freeze solution? Yet such is the case. Of course, water has to be added to the honey, the exact proportion varying according to the lowest temperature

Activities of the colonies of bees during the honey-flow period are carefully watched by keeping close check on changes in weight. Under favorable conditions colony increases 20 lbs. in day.

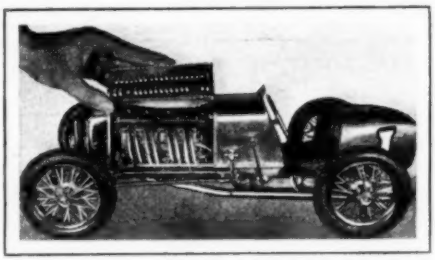
expected. Where zero weather is expected then equal parts of honey and water should be satisfactory, though a quart of alcohol added to each three gallons of the mixture should improve the circulation. To make the solution properly, use a cheap grade of extracted honey, stirring it into hot water. Heat the mixture to a boil and skim off the scum.

Tiny Racing Car Model Has 8-Cylinder Motor That Runs

ATTRACTING more attention for its size than any racing car entered in the 1931 Indianapolis Motor Speedway 500-mile classic, was a gleaming gold and silver plated tiny model of the racing car which Billy Arnold of Chicago drove to win the 1930 Speedway race.

The miniature speed creation was made by L. F. Angevine, 33-year-old Toledo, Ohio automobile salesman, who spent 3½ years and $1,000 on the job. The model is complete to the smallest detail, including an 8-cylinder motor that will run! No wonder its owner values the little machine at $10,000.

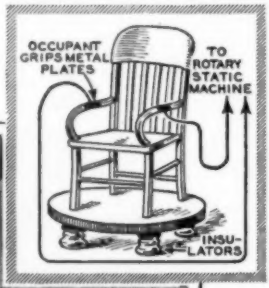
The Lilliputian racing car has all workable parts and is 19½ inches long, 10 inches wide and 5½ inches high, weighing 15½ pounds. All parts are made of finest steel, brass, copper and chrome, with the engine hood silver-plated and the wire wheels gold plated. Three thousand screw holes were made during the construction of the car.



Made of finest metal, silver and gold plated, this $10,000 model racing car has all workable parts.

Barber Speeds up Haircuts with 200,000 Volts Through Customer's Body

The 200,000 volts are sent through the customer's body by means of metal plates on the chair arms as shown.



Charles Hawker makes customer's hair stand on end by seating him in the chair which is charged with 200,000 volts from static machine. As amperage is low, the charge is absolutely harmless!

SHOOTING 200,000 volts of electricity through a customer's body, causing the hair to stand up on end as if in fright, is the somewhat unique though harmless, means employed by Charles Hawker, of Portland, Oregon, to increase his speed at his barber chair.

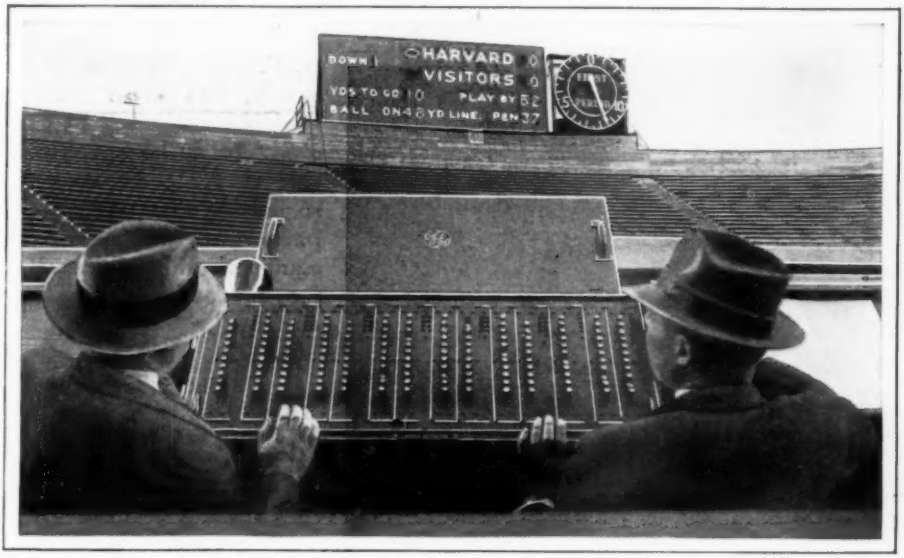
The chair in which Mr. Hawker performs this tonsorial stunt is mounted on insulators, as illustrated at the left. Current is sent through the customer's body by means of contact plates on the arms of the chair.

Device Makes Desert Air at Home

PEOPLE whose doctors order them to a dry climate for sinus infections or other nose or throat troubles are now promised, by a new French invention, the possibility of manufacturing at least a partial equivalent of this dry climate without leaving home. The new device consists of an aluminum case shaped to fit over the mouth and nose and containing an electric coil by which the air that is to be breathed is heated before it enters the breathing passages.

If necessary, however, a chemical drying material may be used in addition, like the chemicals in a gas mask, to make the warm air still drier. By regulating the amount of the electric heat or by passing some of the air to be breathed through the heating coil, any desired degree of heat or dryness may be attained with the new invention.

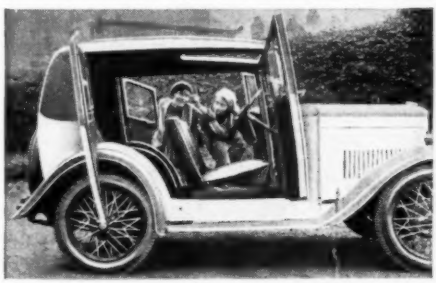
Push-buttons Operate Automatic Scoreboard



Operators situated on the fifty-yard line of the gridiron operate the gigantic scoreboard by means of a battery of push-buttons as shown in the photo here. Electric lights flash the proper letters and figures.

Four-Door Auto Has No Pillars

A NEW Coventry saloon baby car recently exhibited at the Olympia, London, is unique in that it is a pillarless model, and yet has four doors which open together. The innovation makes it impossible for anyone in the rear seat to open the doors without knowledge of the driver, thereby eliminating for children passengers one of the most serious of motoring risks. Despite lack of pillars, however, the tonneau is as sturdy as in braced cars.



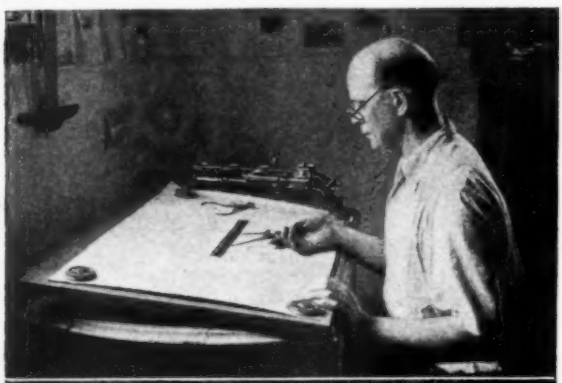
The new Coventry baby car, which has four doors, yet no pillars. Advantage is that child passengers can't open door without knowledge of driver.

SPECTATORS who gather to watch Harvard football games are enabled to follow the ball, penalties, players, plays and the score with greatest ease since the installation of a new mammoth automatic electric scoreboard which virtually shows the status of the game at a glance.

This new board, the first of its kind in the country, was designed and built specially for Harvard's football needs. Thirty feet long by 12 feet high, the face of the board is dull black and its ball and numeral indications are flashed to the spectators by groups of incandescent lamps, so controlled that their brilliance varies with the amount of natural light over the field. The numbers are clearly visible with bright sunlight at 300 yards.

The operator is situated at the 50-yard line and by a series of push-buttons he can instantly make the proper indications. The figures that flash across this new board are accurate and perfectly in time with the play itself. The scorers do not have to wait until the linesmen's findings are wig-wagged to them as is usually the case with a board situated so far from the field of play. A huge clock at the end shows time to go of each quarter.

Making Model Locomotives



All the models made by Mr. Clow are carefully made from the designs of giant locomotives. All the parts are hand finished and cast right in his basement work-shop which is considered unique in that some 300 pictures of locomotives from 14 foreign countries adorn the walls. It includes a picture of the first Chinese-built engine.

A. F. Clow, Washington attorney, has been making models since he was 12 years old. Already he has sold 15 true to scale engines for something like $4,000. His basement work-shop is equipped with all hand or foot operated machinery "for exercise."

A. F. CLOW, a lawyer and transportation expert reaps his fun in designing and building midget locomotives. They are so exact in detail that Mr. Clow has sold 15 of them for $4,000.

Mr. Clow did not embark in model-making because of the possibilities of capitalizing that avocation. The scion of a railroading family, he began building locomotives from scrap material as a boy of 12 and has been at it ever since.

After several years Mr. Clow advertised one of his locomotives for sale. A railroad authority noticed the ad, and purchased the midget engine, proclaiming it the most accurate small size simulation which he had ever seen. From then until now, Mr. Clow has had advance orders.

The average model built by this Washingtonian represents from 450 to 500 hours of careful work and is true to scale. It consists of some 3,000 parts, pieces and similar appurtenances. The frame and running gear are made of mild steel, the boiler is of copper with brass tubes while the drivewheels and cowcatcher are shaped from cast iron castings.

The boiler is approximately 3½ inches by 14 inches and will develop 80 pounds of pres-

Is a Profitable PASTIME

sure. It is tested to a maximum of 100 pounds and is fitted with a steam gauge which registers up to that limit. It is fueled with coke and the screenings of soft coal, is provided with dumpable grates and a standard ash pan. It only takes ten minutes to develop full steam from a dead fire by the use of a pump in the smoke chamber which creates a vacuum and draws the flame through the battery of 14 brass tubes within the boiler. The arrangement is such that both smoke and steam are exhausted through the same stack. An adjustable nozzle is fitted in the smoke chamber and is "locked" for efficient operation. The smoke box door is a brass casting.

The water tank accommodates one quart while additional storage space in the tender is of double that capacity. A stationary pump is in the tender for pumping water to the boiler. Tiny check and ball valves are provided.

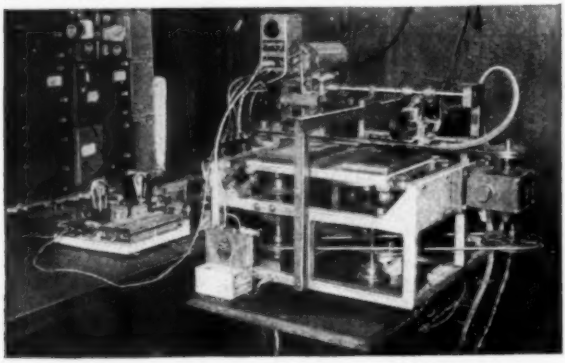
The drivewheels are 3¼ inches in diameter, and rest on springs so that they are balanced properly. The pony trucks are sprung similarly with side equalizing springs.

The "boiled down" engine is fitted with an eccentric valve gear, known as the Stephenson link valve motion. This tiny gear has an eccentric about one inch in diameter while its straps are twice that dimension. Both the throttle and reverse mechanisms are vertical and are accessible through ventilators placed in the roof of the engine cab.

The sand box is nothing more than a dummy but the twin cylinders and steam boxes are real. The stroke of these cylinders is 15/16 of an inch while the bore is ¾ of an inch. The locomotive is fitted throughout with oilers which aid regular lubrication.

The engine that Mr. Clow is shown holding has a rated speed of 15 m.p.h. and can pull a load of 200 pounds. It is valued at $350 and represents 500 hours of shop work. A composite model of the famous English locomotive, King George V, is at present engaging the attention of this builder. He is adding to it some American engine ideas.

"Photo-Graver" Makes Cuts Over Wire in Ten Minutes



The Jewell "Photo-Graver" which makes cuts in ten minutes.

WHAT is certain to be one of the most revolutionary machines introduced in the printing industry was recently exhibited in New York City. Called the "Photo-Graver", the machine is capable of turning out a half tone engraving in approximately ten minutes, without using either chemical or photographic processes.

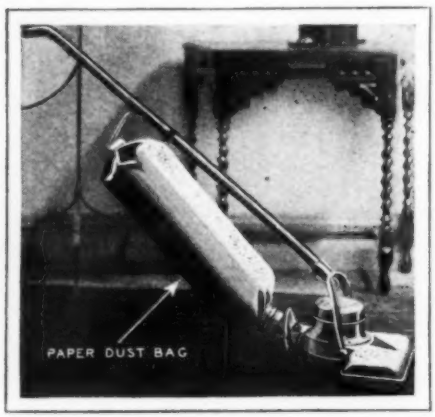
The heart of the "Photo-Graver" is a photo electric cell which scans the original photo, picking up the variations of tone, and transforming the light energy into electrical energy. The machine sends photos over wire.

Cosmic Rays Only Thing Immortal

NEITHER stars nor worlds, sunlight or heavens, can science admit to be eternal. Only one thing known to science can be called immortal—the cosmic rays investigated, among others, by the famous California physicist, Dr. R. A. Millikan. These rays may even be relics of days before there existed any universe as we know it now.

No Emptying With Paper Dust Bag

THE unpleasantness of emptying the dust bag of a vacuum cleaner is eliminated by a new durable paper cloth bag which when sufficiently filled can be thrown away. The expense of replacement of the bag is small.



New paper dust bag may be thrown away when full and replaced by new bag at negligible expense.

Blows Glass Globe Around Cats

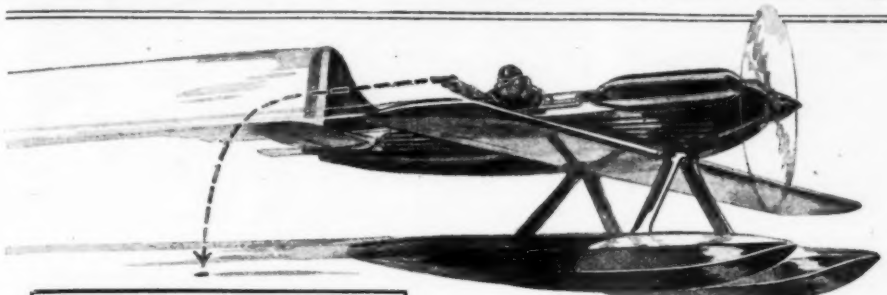
Dick Manley, California glass blower, with glass sphere which he blew around kittens as shown.

TO WIN a bet, Dick Manley, California glass blower, performed an unprecedented glass blowing stunt. He placed three kittens in a glass tube and within three minutes fashioned it into a perfect 26-inch globe with the kittens inside and unharmed. A small hole admitted air.

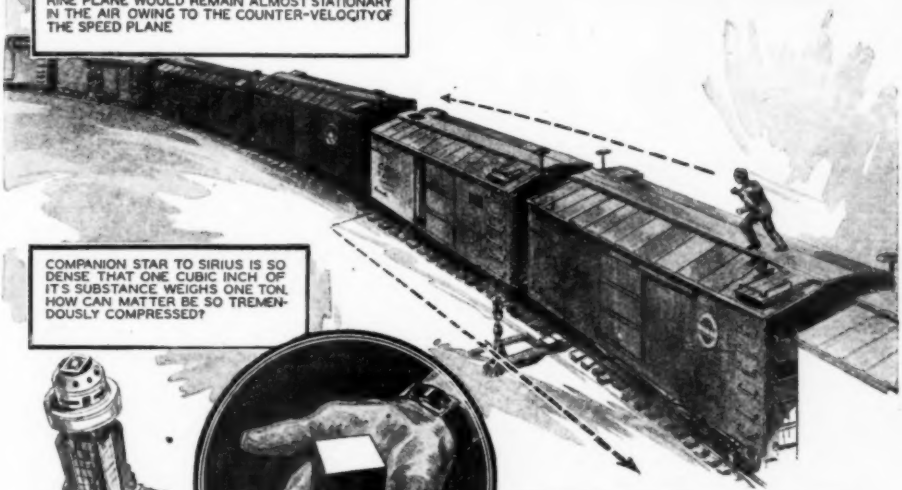
Mice Exterminate Cockroaches

A KIND of mouse which might earn its keep usefully around houses by killing off cockroaches and other obnoxious insects is described by Dr. Vernon Bailey, government naturalist. It is the grasshopper or scorpion mouse, a variety of small field mouse of the western part of the United States. The names of this mouse come from the animals' habit of eating insects, grasshoppers being preferred.

Puzzling Facts for Scientific Study

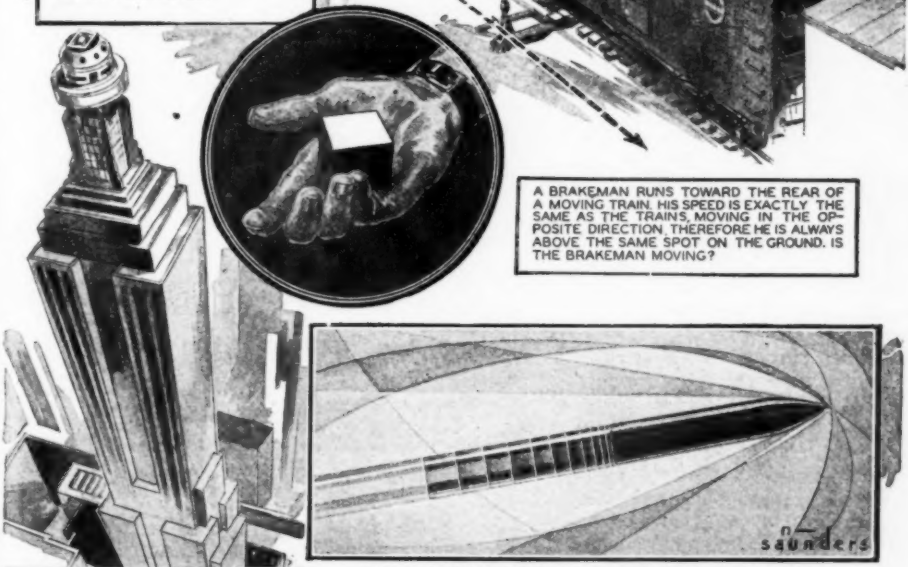


A BULLET OF A 32 CALIBER PISTOL FIRED FROM, AND TO THE REAR OF THE 415-M.P.H. SUPERMARINE PLANE WOULD REMAIN ALMOST STATIONARY IN THE AIR OWING TO THE COUNTER-VELOCITY OF THE SPEED PLANE



COMPANION STAR TO SIRIUS IS SO DENSE THAT ONE CUBIC INCH OF ITS SUBSTANCE WEIGHS ONE TON. HOW CAN MATTER BE SO TREMENDOUSLY COMPRESSED?

A BRAKEMAN RUNS TOWARD THE REAR OF A MOVING TRAIN. HIS SPEED IS EXACTLY THE SAME AS THE TRAIN'S, MOVING IN THE OPPOSITE DIRECTION. THEREFORE HE IS ALWAYS ABOVE THE SAME SPOT ON THE GROUND. IS THE BRAKEMAN MOVING?



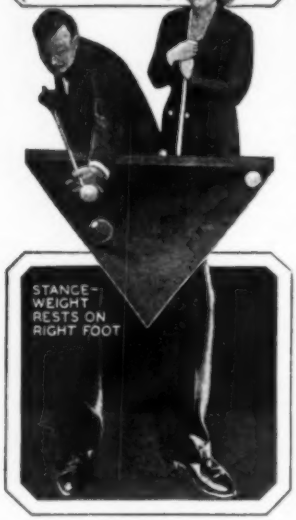
LETTING THE THICKNESS OF A POSTAGE STAMP REPRESENT THE RECORD OF HUMAN HISTORY, THE EMPIRE STATE BUILDING WOULD NOT BE HIGH ENOUGH TO REPRESENT THE REST OF ASTRONOMICAL TIME

A SOLID STEEL PROJECTILE FIRED STRAIGHT OUT INTO SPACE AT A SPEED OF 160,000 MILES A SECOND WOULD LOSE HALF OF ITS LENGTH, AND IN A FEW MILLION YEARS WOULD RETURN TO ITS STARTING POINT, REGAINING ITS NORMAL LENGTH WHEN IT IS STOPPED. (EINSTEIN THEORY)

Willie Hoppe Gives Valuable Tips on Champ Billiards

Three tournament-winning hand positions employed by Willie Hoppe, champion billiards player, are illustrated above. At left, Hoppe demonstrates technique of "draw shot" to Anita Page.

IF YOU'RE a billiards fan stand by for a few minutes and Willie Hoppe, world's champion billiard player, will give you a few pointers on the game. His champion technique is illustrated in the accompanying photos. In the upper left is shown the proper hand position for the "bridge" or draw shot. In the center photo, Hoppe demonstrates his famous "lateral" hand position on the shaft of the cue. With the "masse" hand position at the right he has won many tournaments. Correct stance is an important item in the winning of a billiard game, too. At the left, in the lower photo, Hoppe shows how weight should rest on feet.



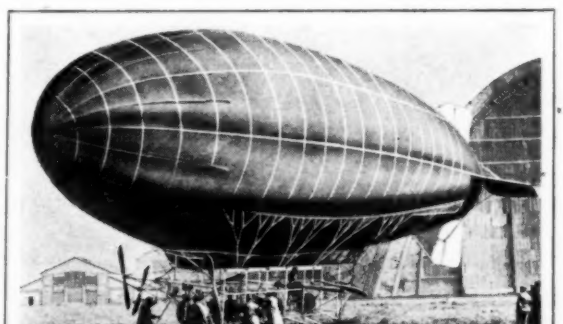
Above photo demonstrates correct stance—weight on right foot.

Thick Layer of Cream Doesn't Mean Best Milk

THE thick layer of cream on top of a milk bottle by which many housewives judge whether or not the milk is rich and good, has no real significance. Milk with no visible cream may be just as good or better. The difficulty with the simple cream-layer test is that many samples of rich milk show no pronounced cream layer.

French "Helicostat" Flies Like Dirigible, Ascends Like Helicopter

A STRANGE contraption recently made its appearance in the aeronautical world. It's a cross between a dirigible and a helicopter and is called a "Helicostat" by its inventor, M. Oehmichen, a French engineer, who flew it in a successful test recently at Orly Field, France. The hybrid craft has six propellers, all of which can be turned in any direction at the control of the pilot. One engine powers all the props, to which it is connected through a system of gears and chains. Like the helicopter, this Helicostat can rise or descend vertically and when in the air flies like a dirigible.



Invention of M. Oehmichen, French engineer, this "Helicostat" is powered by single motor driving six adjustable propellers.

"Venetian Blind" Sails Take More Power From Wind

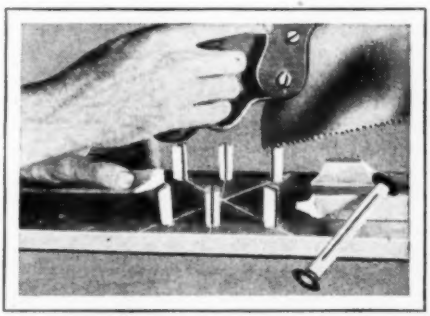
A REMARKABLE new type of model racing yacht with "Venetian Blind" sails has been invented by William Cochrane, of Hampstead, England, who claims that his creation is much faster than the ordinary yacht, and that given a chance to prove its stuff on a large scale it would be quick to demonstrate its superiority.

His sail system involves the same principles as steam and water acting on the blades of a turbine, the sails being controlled by one man or electrical power to gather greater power from the wind.

William Cochrane, of Hampstead, England, demonstrating his unique model sail boat which employs "Venetian Blind" sails to gather full power from the wind and avoid loss from "ballooning."

Miter Box From Film Spools

FILM spools can be used to advantage in making a dowel miter box, as illustrated in the photo below. The miter angles are marked with a square on a suitable wood base. The holes, the same size as the film spool, are bored on these markings about ½-inch from the edge of the base. Long film spools are sawed in two and inserted in the holes. The slot in the film spool must align with the miter markings. The spool sections are then glued into position, and secured by small brads through the metal ring on the underside.



Miter angles are marked on suitable wood base and film spools inserted in positions as shown in photo. Note that slit in spool follows markings.

Famous Violin's Tones Pictured

DR. William Braid White, director of the acoustic laboratory of the American Steel and Wire Company, is photographing the tone quality of a Stradivarius violin. He believes the secret of the tone quality lies in the striking power, simplicity, and symmetry of the fundamental vibrations of the sound waves.

Balance Weight Improves Shooting

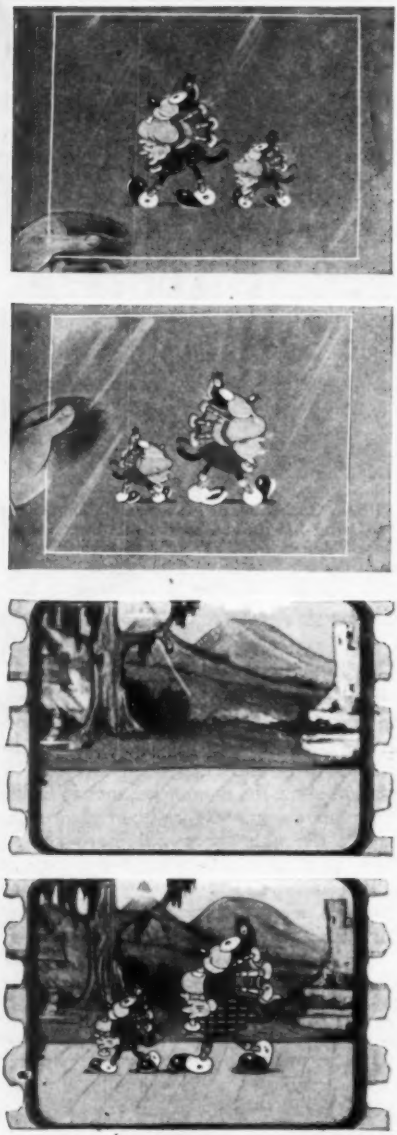
RICHARD STEIFF, a toy manufacturer of Jackson, Mich., takes his rifle practice seriously. Proof of this lies in the fact that he has devised a balancing contrivance to insure more accurate shots. Attached to the underside of the rifle, as illustrated in the photo below, the counterbalance is fashioned from an automobile radius-rod, serving to steady the aim for a bull's-eye shot. The rifle, too, was constructed by Mr. Steiff, and is equipped with telescope sights for long distance firing. Thanks to his new invention, Mr. Steiff has improved his marksmanship considerably. The stunt contains a helpful hint for marksmen who go in seriously for rifle practice.

To improve marksmanship, counterbalance made from radius-rod of auto was attached to the rifle.

At Last~

by JAMES BOWLES

After years of a successful black-and-white career, animated cartoons are due to take on the additional appeal of color, thanks to the perfection of a process which is explained in detail in this article.



Steps in production of an animated cartoon in color are, from top to bottom: Celluloid on which characters are drawn in ink; reverse side of celluloid showing how colors are applied; background scene, drawn on celluloid; and animated characters photographed on background. Drawing on opposite page shows shows how color is applied by means of dyes applied to film emulsions.

THE first of 13 one-reel animated cartoon comedies in color have just been completed in Hollywood, marking the beginning of a new era in this popular form of entertainment which has already made Mickey Mouse and his cohorts the highest paid actors in the movie world, although they draw no salaries. Ted Eshbaugh, a Boston artist, is the man who has at last succeeded in producing animateds in color.

Making the colored comics duplicates the manufacture of black-white comics excepting the intricate application of color to the characters and transferring that color to the double negative that creeps through the recording camera a frame at a time. When you consider that 15,000 separate drawings on celluloid must be made by a staff of artists for a single reeler, composed of 16,000 frames, and that each figure or group of figures on each celluloid will display possibly six color combinations, you get some idea of the intricacy and tediousness of the process.

Let me give you some idea of the mechanical set-up before explaining the process. Eshbaugh mounts his camera lens-down on two beams above a table about the size of an ordinary office desk. An electric motor, connected by a rod to the camera's driving mechanism, runs continuously. When the operator trips a key with his right hand, the rod engages the driving mechanism and turns the camera one frame, or one exposure.

But what is in the camera's field of vision? First, a sheet of optical glass three-eighths of an inch thick and about 12 inches square, is set on a sheet of sponge rubber. The optical glass, which costs $30, is as nearly colorless as possible in order to give no reflections. The glass is held in two metal arms, which raise and lower by a foot pedal under the table. But we're not ready

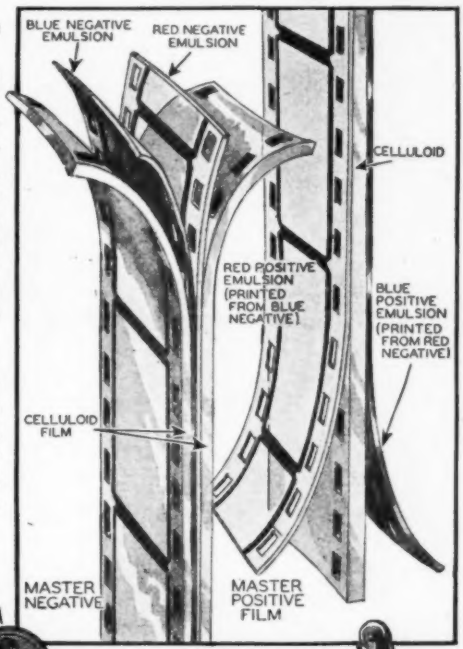
Movie Cartoons in Color

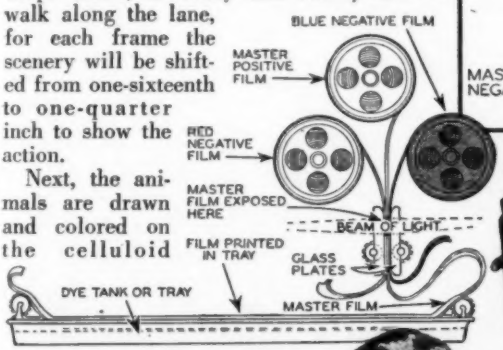
to shoot yet. First, we must create the cartoons.

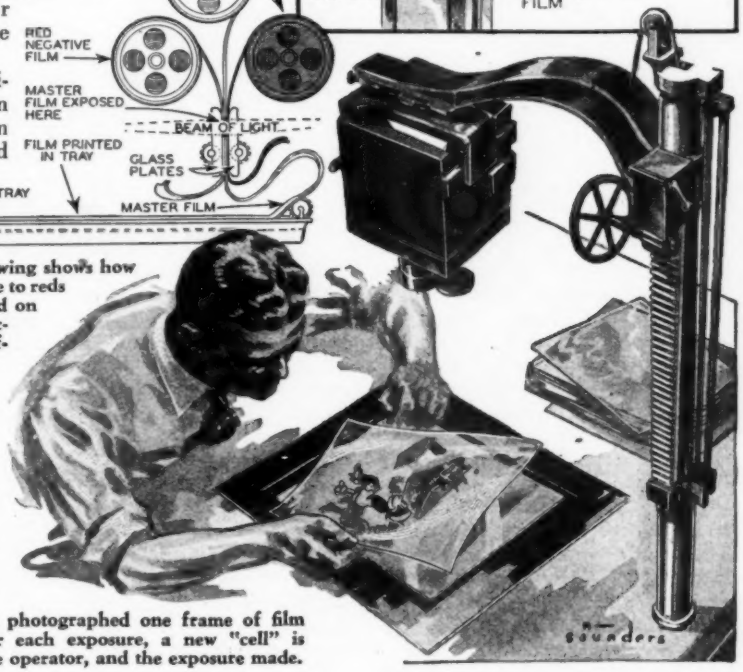
So we go back to the room where a dozen "animators" are engaged in drawing pencil sketches and others are coloring the celluloid sheets. The latter is the real background and secret of the whole process. Eshbaugh conducted hundreds of experiments to get the correct color combinations, colors which would not change by the time they appear on the screen. How he accomplished that is, of course, his secret; a secret for which producers would pay a huge sum.

To begin, suppose the action shows Goofy Goat and Nanny Goat, the names given the principal characters in this series, along a country road. A background of rural scenery is painted in colors on a paper strip possibly four feet long and a foot deep. Later, if Goofy and Nanny are to walk along the lane, for each frame the scenery will be shifted from one-sixteenth to one-quarter inch to show the action.

Next, the animals are drawn and colored on the celluloid







Upper corner drawing shows how emulsions, sensitive to reds and blues, are used on single film, producing multi-color effect when dyed in tray. Red and blue-dyed film, placed together, give many colors on the screen. Photographing animated cartoons is the same process, whether they are colored or not. Celluloid sheets containing drawings, are photographed one frame of film at a time. After each exposure, a new "cell" is put in place by the operator, and the exposure made.

These artists make 15,000 separate drawings for each animated cartoon comedy of one-reel length.

Goofy Goat and Nanny Goat, principal characters in the first successful colored animated cartoons.

All these instruments are required to produce the sound effects for cartoon films. The comedy is projected on the screen in the background, and sound effects synchronized as the film is run off.

sheets. Sometimes an entire group of animals will appear on a single sheet, again possibly only a hand will be drawn on one while the rest of the body appears on a second sheet. For this reason:

One scene shows Goofy driving a tiny blue automobile in traffic, against a blue sky of different density. The sky was painted on the paper background. When ready to film the scene, the background was laid out over the sponge rubber on the camera table. Then a celluloid on which was painted the red, white and black explosion of the exhaust from the car was placed over the background. The second "cell" showed the blue car. On a third "cell" appeared Goofy, wearing a black waist and red pants. The fourth contained a traffic cop wearing brown pants and a blue shirt. On the top, or fifth, "cell" appeared the cop's arm, his hand clutching first a red, then a green handkerchief. And on top of all these the plate glass was pulled down to keep them in place.

For the first time, a young producer films a movie cartoon, not only through five thicknesses of celluloid, but also in color!

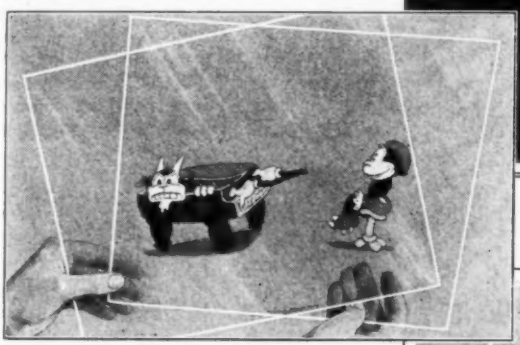
This is, of course, primarily a color "gag", intended by Eshbaugh to show on the screen that he can change from a brilliant red to a brilliant green in the twinkling of an eye and get away with it.

Cartoons Sometimes Photographed Through Five Layers of Celluloid

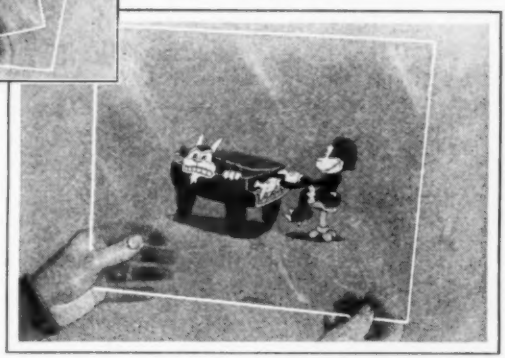
While the traffic cop halted the car, he blew his nose first with the red handkerchief, then with the green. As he did so whistles blew, halting and starting the traffic. His arm was "animated," and only that celluloid was changed during the brief episode. The sounds were synchronized after the picture was completed.

"In building colors," Eshbaugh explained, "I start from the bottom and work to the top. I used red in the exhaust to carry through the four top celluloids. We use five celluloids for some scenes in each picture. Ordinarily, three will be used, but intricate action sometimes requires more. The change will not be apparent to an audience, however, because the more intense colors carry through.

Ted Eshbaugh in his workshop, examining a strip of colored animated cartoon film prepared by the process he discovered.



To save work, "cells" for one bit of action are sometimes drawn in pairs. In this bit, the goat inside the piano and the hands move; the player remains stationary.



Here the two drawings shown at left above are placed together, ready for photographing. In the next scene, the piano drawing will be changed, but the same drawing of the player will be used.

"In order to keep uniform colors throughout a picture, on which we may be working several weeks, I mix my paints from imported pigment in one big batch. We also have a key color chart, from which we use principally red, blue, green, brown and gray. I found early that some standard colors would give an entirely different effect on the screen. Some go light, others dark. I now have a special color, which I have been unable to name, that produces a yellow; another gives a green, another a brown. These are produced through no formula, but from tedious experiment in recording and studying them.

"It is possible to record the colors through five thicknesses of celluloid because of a combination of lighting and color. You see, we paint the "cells" on both sides. The blacks and white appear on the top side, the other colors underneath. Possibly a dozen individual paintings will be necessary to show the extension of an accordion in the hands of an animal. And each must be complete, accurate and color-right."

Although six colors may appear on a

(Continued on page 178)

Ship Travelers Take Deck Exercise on Slow Motion Bikes

Steamship passengers take daily exercise on decks with these "slow motion" bikes, which are balanced by small wheels geared to pedal sprockets.

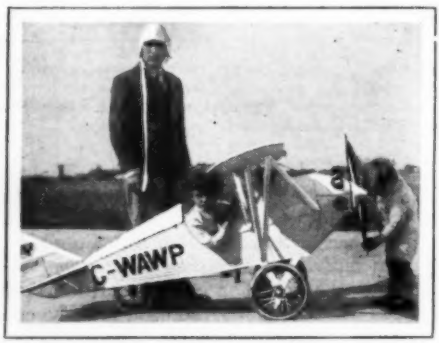
STEAMSHIP passengers can now take their daily exercise pedaling around the deck on a bicycle. This bike, however, does not develop the speed of the ordinary bicycle, but is geared down so that the vehicle moves around the deck at a snail's pace, thus giving a good workout in a single round trip.

For balancing purposes, two auxiliary wheels are attached to the center of the frame, as shown in the accompanying photo. The sprocket is geared to these wheels instead of to the rear wheel, so that speed is greatly reduced. In all other parts the bicycle has parts like the standard land-going bike.

This novel means of doing morning workouts was recently introduced by the Hamburg American Line, and is in use on their liners. Passengers prefer it to the indoors exercising machines more commonly used.

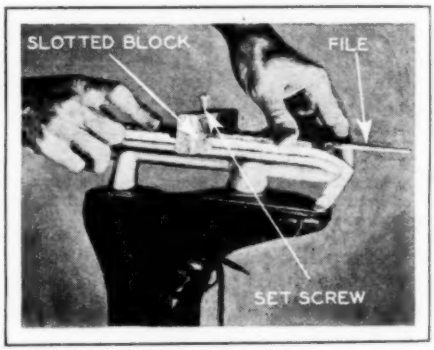
Model for Air-Minded Youths

MR. J. A. MOLLISON, the Scottish aviator who recently set up a new record for the Australia to London flight when he spanned the distance in less than nine days, is taking steps to pass his flying talents on to the younger generation. In the photo below he is seen initiating two youngsters into the secrets of the Moth plane, using a remarkable Moth plane model on display at the Heston Aerodrome, near London.



J. A. Mollison demonstrating points of Moth plane to youngsters, using Heston Aerodrome model.

Block Aids Skate Sharpening



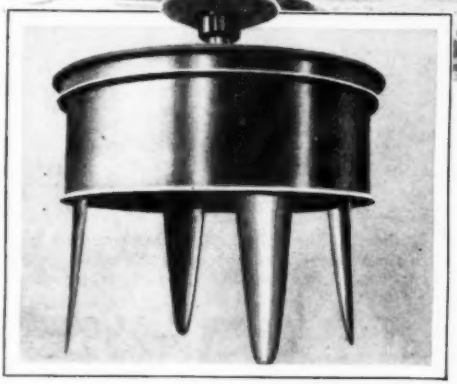
File is set in slotted block and tightened by set screw as illustrated here. Sharpening is merely a matter of sliding file back and forth over skate.

WHEN sharpening ice skates a slotted block of wood shaped as illustrated in the photo above will hold the file squarely on the ice runner. The block is made from hardwood with a vertical slot just wide enough to slip over the ice runner and with a horizontal slot wide enough to hold a flat file.

The file is held firmly in this slot with a set screw placed in the top of the block. In this manner it can be moved back and forth over the ice runner, assuring a square cut will be made. A rat-tail file can be used for hollow-ground runners.

New Type Propeller Aids Maneuvering

Above drawing illustrates installation of new "Voith-Schneider" propeller in hull of motor boat.



Fins which act as blades on "Voith-Schneider" prop project downward from revolving drum geared to the motor. Automatic feathering action of the fins provides traction through water, and permits boat to be maneuvered with utmost ease.

OPERATING upon a radically different principle of propulsion, a new propeller recently introduced in Germany has four automatically feathering fins which project downward from a revolving drum. Chief among its advantages are its economy of power, its quick braking action, and its easy maneuvering qualities, as shown in drawing.

How to Ward Off Flu Attacks

RULES to avoid having influenza when the season for this disease comes around next February or March are suggested by an eminent physician. In December the thing to watch is an adequate combination of warmth and ventilation in rooms used for work, living or sleeping. Open bedroom windows at night, even in cold weather. January requires chiefly avoiding persons who have colds, as evidenced by coughing or sneezing. As the chief danger season for influenza arrives in February and March, the careful avoider will continue to keep a check on health habits.

Flowers From Bamboo Shavings

ARTIFICIAL flowers striking in their resemblance to the real article are now being manufactured from bamboo shavings imported from Japan. What makes possible this resemblance is a secret process whereby the shavings are treated with a chemical that makes them soft and pliable, especially suitable for use as artificial petals.

Flower petals are made from bamboo shavings.

DARING DEATH *for*

Herbert McCory flew 200 miles through a blinding snowstorm, which stopped the air mail, to get this remarkable photo of the Auburn prison riot.

From this precarious position the flying photographer records the events which make history.

by HERBERT R. McCORY

Famous Aerial News Photographer

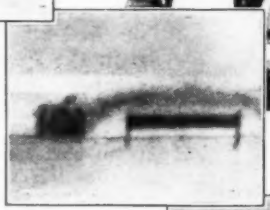
When you open your morning paper you take it for granted that it will contain striking photographs of that prison riot, ship or airplane disaster, or other news event of general interest. This article, by America's premier flying photographer, tells of the thrills and dangers of securing such news pictures.

DARE-DEVILS, no matter how hazardous their own particular calling might be, will sniff the ozone derisively when a neutral party tries to tell them of another whose vocation is supposed to bear more certain promise of doom.

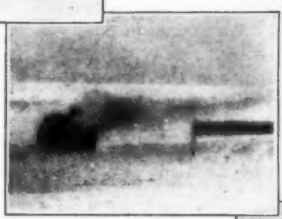
Having spent practically all of my life consorting with fearless men who have trifled with their fates, I know whereof I speak. The perils which a flying photographer faces are fairly comparable to those of his death-defying kinsmen in other walks of life.

The corollary is equally true. The thrills and the rewards which go with this far-from-crowded profession of taking pictures from the air are justifiable reasons for one to engage in this pursuit. It also provides an outlet for one's scientific and mechanical inclinations, for I am always seeking

News PHOTOGRAPHS



A news-reel camera man photographs approaching death. These four remarkable photos were made by Chas. Traub who was killed a second after the fourth photo was taken.



Quick footwork on the part of the photographer averted a tragedy here. This photo was snapped as the car skidded and crashed through the fence at the Creve Coeur track.

These photos show Lee Bible's car skidding to destruction as it approaches the measured mile on the sands of Daytona Beach during his effort to break the world's speed record.

to invent new photographic devices as well as improve on existing apparatus. Special instruments have to be used in this type of photography.

This work is a response to the universal clamor for news pictures, exciting, unusual, mystifying "shots" from the skies. If a picture newspaper or a photo agency wants a certain conceived photograph badly, hundreds, even thousands, of dollars will be plunged into the operations necessary for obtaining it. The picture-minded public's appetite must be sated. It is part of a battle for circulation whose frenzy never ceases.

One of the most destructive and poignant spectacles I ever witnessed and photographed from the sky was the big fire which broke out near Bayonne, New Jersey, two years ago. Several million dollars worth of oil went up in smoke. It was one of the toughest assignments my pilot and I ever covered.

A huge, mushroom-shaped column of smoke, as if a black mountain suddenly shot up out of the ground, rose several hundred feet into the sky. The overflowing and bursting of big oil tanks cast a surging flood of blazing oil over the Kill-Van-Kull waterway, between Staten Island and New Jersey, threatening all shipping in New York Harbor.

This relentless sea of fire and smoke covered an area over a mile in diameter and at about five-minute intervals tanks blew up with thunderous detonations, rocking sky and earth.

Fleets of fire-boats strove to prevent the flame barrages from spreading, but it was like throwing a snowball at the sun over the Sahara. Firemen were fighting desperately to get within effective proximity of this inferno. But they were driven back by the terrific heat and the exploding tanks.

This was obviously a scene which could not be adequately and picturesquely photographed by a land cameraman. It called strictly for a flying photographer, not only to get a panoramic "shot" but also to select the most spectacular scenes for photographic reproduction.

Harold McMahon, my pilot, himself a keen student of photography, would circle this awe-inspiring catastrophe to survey it while momentarily we feared that the heat

from the conflagration would cause the "dope" on our wings to burst into flames.

"Mack", in the cockpit, would grit his teeth, lower his head to shield it from the intense heat and swoop downward, almost into the fire, while I sat in the open doorway of the ship, raising my head only long enough to snap a picture, and then Mack zoomed off for a minute's respite.

We got home safely with our pictures and they were reproduced in every large paper throughout the country.

A short time afterward Mack and I set out from a Long Island flying field to keep a date with a group of sea-wreckers who were undertaking to bury the sunken S. S. *Fort Victoria* beneath the ocean floor. The ship had been partially sunk in a harbor collision but a large part of the vessel remained above water and was considered a serious menace to navigation.

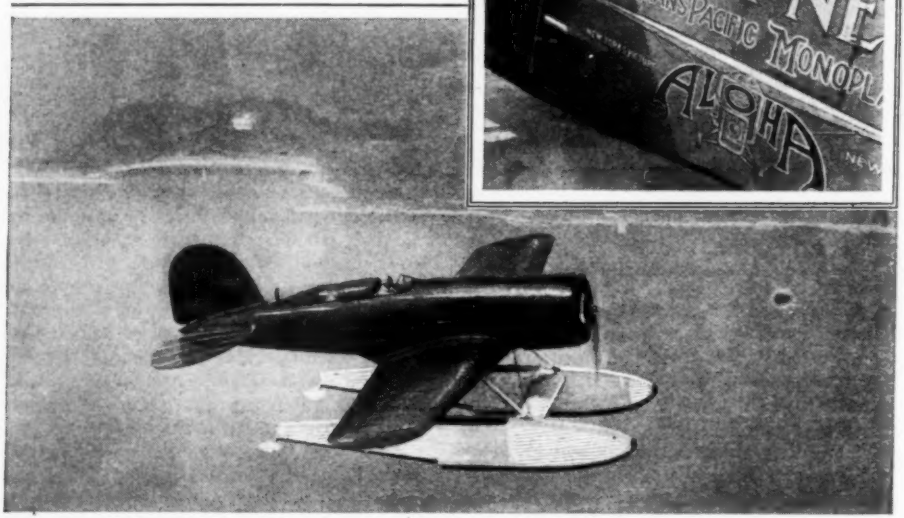
It was planned to submerge the derelict for all time with the aid of fifty tons of dynamite which had been systematically laid in sacks so as to scoop up a hole sufficiently large to receive the boat in its final resting-place.

When the blast was touched off, a great spout of water rose, seething skyward like a huge geyser, for 1,200 feet. We were in direct focus for this shot and got one of the most beautiful photographs I have ever taken.

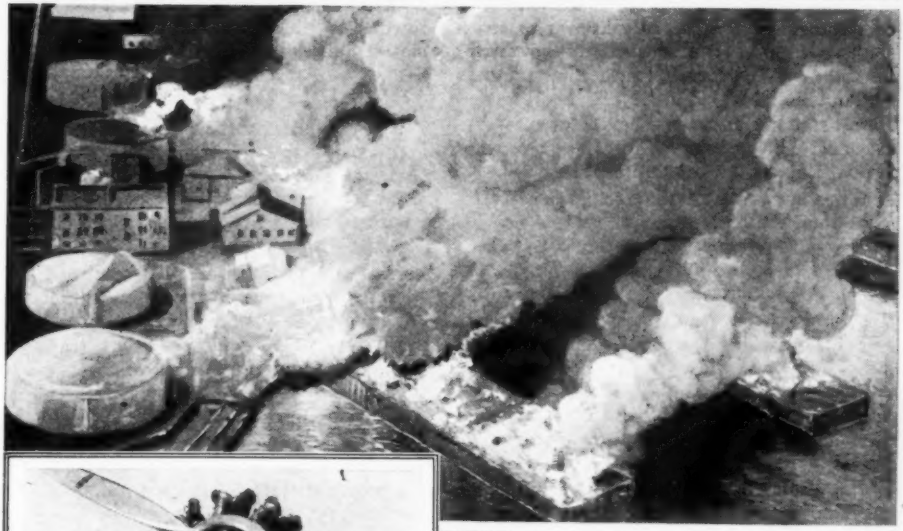
At another time a big freighter was grounded on a sandbar off Montauk Point, Long Island. This furnished a dash of adventure which I shall long remember.

We flew through thick, heavy clouds until we finally reached the helpless craft. The air was unusually rough. A breeches buoy was being passed from the shore to the boat by the coast guard for the purpose of removing the crew.

As we circled the ship and swung around to take in the scene for a comprehensive picture, we hit a terrific bump which caught me leaning far out of the door, with a heavy camera in my hands. The ship and I had started to part company, as I suddenly realized that I had neglected to fasten the



Lindbergh's plane leaving New York for its long trip to the Orient. McCory has photographed the take-off of every ocean flight starting from New York. Above he is shown at his point of vantage.



Pilot and photographer risked death while diving toward the blazing inferno of the Bayonne, N. J., oil fire, but came back with exclusive photographs.

The world's premier flying photographer and his capable pilot pose before the flying dark room.

safety belt about my waist. It seemed a choice between saving my camera or my life.

Lightning thoughts flashed through my mind. I surely hated to part with that precious camera. I hung on to it for dear life. Suddenly Mack came to the rescue just in the nick of time by scooping me back into the ship by a skillful rolling maneuver. I must have gasped a million sighs of relief after that close shave.

Some people speak of the thrill of a lifetime. I feel that an aerial cameraman has a lifetime of anxiety and excitement crowded into each working day. Kindly persons, if I might venture beyond the borders of strict propriety with immunity, have dubbed me the ace of America's flying newspaper photographers. It is perhaps a dubious distinction in view of the fact that I do not know of more than five persons engaged in the same business and all of us are constantly flirting with death.

The exercise of care and sober judgment, however, will prolong a flying photographer's going south, as they say, in a hurry. I have been a photographer since boyhood days. By the time I was 7 I was "mugging" the neighbors' children and selling the finished products to their parents.

After I got through with an elementary education in the public schools, I got a job in a portrait studio. That wasn't very exciting, so I became a newspaper photographer. Finally I landed as a cameraman with the old Lubin Motion Picture Company where I remained four years.

At the outbreak of the war I was assigned to Underwood & Underwood, the photo syndicate, to obtain special war scenes. Later I joined the staff of the New York Daily News, where I have been an aerial photographer for nearly ten years.

News Photos Taken in Air Are Developed Before the Airplane Lands

When I first entered the field, this type of photography was hardly known to newspaper editors. It was utilized principally by the War Department in getting pictures of land and sea layouts. The big demand for interesting and startling pictures to synchronize with news stories in the daily press brought about the development of this work.

When a search of the factories and laboratories making cameras adaptable for photographic work from the air proved futile, I was commissioned to design and build a special one.

Photographers who occasionally soar into the skies, and who are not members of the press, always work under conditions of perfect light and weather. In this category I am referring to government air photographers and those employed by commercial agencies to do panoramas or skyscrapers.

But the news picture chasers in the air must be prepared to make photographs under the most trying and inclement conditions. This is generally the case. It seems that news stories requiring an aerial photographer have an uncanny knack of breaking at most unfavorable times. Of all the crew regattas I have ever covered, an average of four out of five have been staged on cloudy or rainy days.

Ocean liners never seem to run aground under ideal weather conditions and convicts invariably pick a stormy day for a prison riot or jail delivery.

At an early stage I discovered that it was indispensable that the finest and fastest lenses available must be used in such a camera. And that it must be the most flexible camera that can be built. Super-speed plates are also of enormous importance and highly perfected fillers are equally essential.

Without a fast lens and fast plates the aerial photographer would find it necessary to stop work, even in the summer, not later than 4 p. m., while with our perfected equipment we frequently photograph important happenings and get excellent results as late as 9 p. m.

On a cold winter day in 1930, I was given orders to commandeer my pilot and proceed to the state prison at Auburn, N. Y., where a riot had broken out. Rebellion was raging and the big prison was being set afire by the leaders of the uprising. We started for this scene at 3. p. m.

A hasty check-up of weather conditions had disclosed that a terrific snowstorm was in progress along the entire route. The first train that could bring pictures into New York would not have arrived in that city until sometime the next morning. But pictures were desired for the editions of that

(Continued on page 176)

Here is a German news "lens hound" shooting Berlin from Europe's biggest electric sign.

Minutes are saved by developing aerial photos in McCory's flying dark room at right.

Oddities of Science

by NIC SPRANK

YOU CAN BURN YOURSELF WITH LIQUID AIR, WHICH IS - 220° BELOW ZERO
THUNDER IS CAUSED BY A VACUUM
"DRY ICE" DROPPED ON CLOUDS FROM AN AIRPLANE CAUSES — RAINFALL
PHOTOGRAPHIC PLATE
PRINT
LIGHT EMITTED BY GLOW WORMS HAS THE SAME EFFECT ON PHOTOGRAPHIC PLATES AS X-RAYS
EVERY CAN OF PAINT CONTAINS A PARTIAL VACUUM
HOUSEHOLD PAINT
ANTS HAVE BEEN OBSERVED TO SET BROKEN LEGS OF INJURED COMPANIONS IN PLASTER
LIQUID AIR CAN BE BOILED ON A CAKE OF ICE
Nic Sprank

When lightning rends the air a partial vacuum is formed by the great heat. Air rushing in to fill the space causes the thunder clap. Oil in a paint can absorbs oxygen, causing the vacuum. If you've observed any scientific oddities send them to Nic Sprank, care of Modern Mechanics and Inventions.

Fortune Making Ideas

From the English Institute of Patentees (Inc.) comes the call for a magazine hammer that will automatically supply a small nail at each blow. Such a gadget should be worth at least $50,000.

How to Get Help on Developing Your Inventions

Fortunes await the inventors who will develop the ideas which Mr. Yates sets forth in this department. Manufacturers are calling for the new inventions and will reward you richly for solving their problems. Mr. Yates, who conducts this department, is well qualified to give sound, practical advice on questions of scientific, patent and law procedure, and will gladly assist Modern Mechanics readers along these lines. Address your questions to Raymond F. Yates, care of Modern Mechanics and Inventions, enclosing a stamped and self-addressed envelope.

Left — What wrist watch wearers are badly in need of is a strap that will not be continually slipping around the wrist. Watch manufacturers will quickly pay a young fortune to the lucky inventor who will settle this simple problem in a simple and inexpensive way. A strap that could solve this problem should cost very little and not be complicated in the least.

BEFORE we consider this month's group of inventive problems, I should like to have a word with you about mail. During the past month I have been actually showered under with correspondence and those who have to wait a bit for their answers should not grow impatient. I am doing my level best to keep this correspondence up to date, but it is quite a job when one has as many as forty or fifty letters a day at times.

In writing, please be brief. Get right down to polished brass tacks in the first sentence. It will help me and it will speed up the work of answering. I also want to warn those fellows who fail to send self-addressed and stamped envelopes that their letters are put aside and answered when I have time—which isn't often.

Another thing: please don't send models.

After each shave a safety blade has to be taken out and cleaned. The inventor who devises a scheme to eliminate this will reap huge rewards.

for Inventors

by RAYMOND F. YATES

A good drawing will serve the purpose just as well.

Now that the lecture is over, please keep in mind that I am always glad to hear from you and that it is a pleasure to help those of you who have inventive talent. I am utterly appalled at the ingenuity displayed by some fellows and I am sure that they are on their way to making money in the easiest and most fascinating manner that I know of.

Heat-proof auto paint or an insulating shield that will prevent paint on the hood of the car from cracking is in demand by motor car manufacturers. $100,000 would not be too much for this idea.

1. Automatic Magazine Hammer

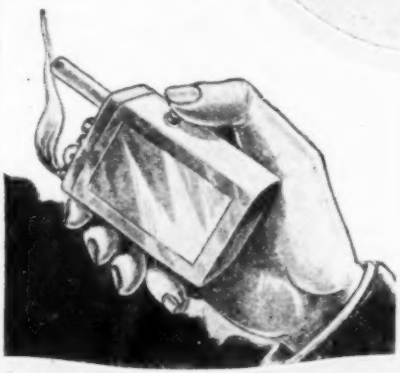
I HAVE before me as I write this a very interesting communication from the English Institute of Patentees (Inc.). It outlines the need for a magazine hammer that will supply a small nail or tack every time the hammer head is struck. The nails may be held to the hammer magnetically. The thing to be developed is an automatic feed that will place a nail on the end every time a blow is struck.

If you are a chemistry fan, work out this one—a pencil that really writes in black and not in grey.

Imagine how convenient such a thing would be for a fellow putting up posters or for a man putting on paper roofs. I am going to be terribly disappointed if I do not receive a winning answer to this need. Last month, I advised ten fellows to take out patents on their ideas because they were so good. This month I want to beat this score.

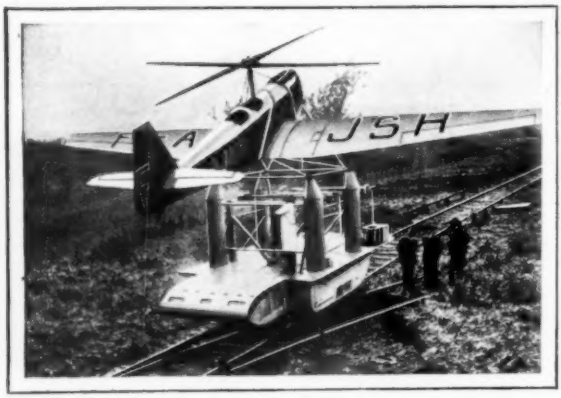
Specifications: Smallness and simplicity should be the features. The device should also be so arranged and designed that it would not be necessary to arrange the nails in any particular order when the magazine

(Continued on page 186)



A combination cigarette case and lighter will meet with ready approval from thousands of chronic smokers. Case should be both artistic and practical.

New Type Gyro Plane Tested on Electric Rail Carriage



The "Clinogyre BO" mounted on its test carriage. The plane and carriage were invented by Bessiere and Odier, of France.

AS interesting as is the new type of gyro plane now undergoing exhaustive experiments in France, the method of testing is perhaps of even more interest.

The trial carriage is electrically driven and attains a speed of from 60 to 80 miles an hour on rails. By means of measuring instruments on the carriage, the wind pressure, lifting power, derivation of lift, and the stresses on various parts are registered.

The plane itself is of the conventional type, except for a pair of large propellers, which turn in opposite directions, mounted on a stub shaft above the plane. These propellers work by wind pressure.

Three Rules to Combat Gray Hair

A PRESCRIPTION against gray hair embodying the latest scientific information has been published by the New Health Society of London. Gray hair may be due to any bodily condition which lowers the general health or decreases the active circulation of blood in the scalp.

The prescription for prevention involves three things. First, keep the head uncovered as much as possible and avoid tight hats. Second, massage the scalp vigorously night and morning with the fingers, using any good hair tonic every day and some bland oil once a week. Third, the diet should contain whole wheat bread instead of white bread. Fruit salads are advocated and ample quantities of fresh vegetables, especially spinach.

Pad Relieves Motorist Eye Strain

This eye pad relieves eye strain from long motor trips or from sun glare.

A SPECIALLY designed eye pad, recently introduced, needs only to be moistened and worn over the eyes to give relief from eye strain due to long motor trips or sun glare. The pad comes in a convenient form for carrying in a small space and can be applied easily.

Subject Operates New Camera

With new camera, subject poses before mirror as shown here and clicks shutter with extension bulb.

A NEW camera, designed by Luther J. Simjian, of Yale University, permits photo gallery customers to pose to their heart's content for the picture and then operate the camera when ready. A mirror close to the lens shows what the picture will look like and extension bulb clicks shutter.

Movies Reveal TILDEN'S Tennis Skill

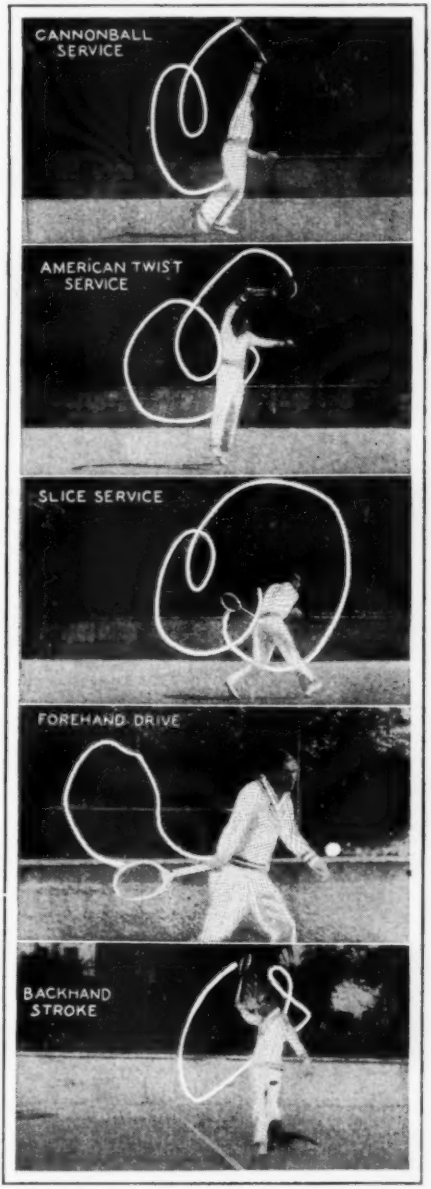
THE skill and science that William T. Tilden brought to the tennis world and which carried him to seven national championships as well as innumerable Davis Cup triumphs, is now given back to the world at large through the medium of the motion pictures.

Tilden has recently prepared a series of instructive pictures, clearly illustrating each stroke and its relation to the game in general, describing the value of footwork, balance and stroking as a unit in perfecting the court game.

The photographs shown at the right of this page are taken from the motion pictures. The white lines in each case describe the arc followed by the racquet in stroking the ball, and if you think a tennis racquet could never take such a course, then think again.

The top picture shows the former tennis champion as he delivered his famed cannonball service, while the one below it illustrates the American twist service. The third picture from the top shows the slice service as perfected by the slim master of the courts. Note carefully the arc of the swing in each case, the top of the stroke as compared with the other services, and the complete circle of the swing which follows completely through.

The fourth picture shows Tilden as he stroked the ball in the forehand drive, which he claims is the most necessary stroke in the game. The fifth picture illustrates the perfect backhand stroke, which should be used when the player is perfectly in position, sideways to the net and not cramped.



This series of photographs illustrates five of the strokes which made Tilden the tennis king for seven years. The white lines show the course taken by the racquet in each stroke. Tilden's art is now passed along by the movies.

A Substitute for a Pipe-Wrench

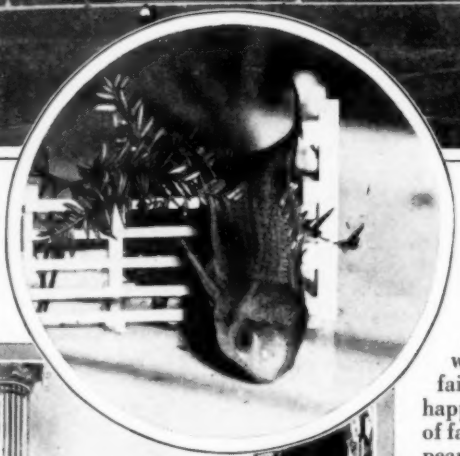
Photo shows how to handle a pipe up to three-fourths of an inch in diameter.

WHEN no pipe-wrench is available to handle pipes or bolt-stems of small diameter, a pair of slip-joint pliers and a large monkey - wrench may be effectively substituted.

As may be seen in the picture, pressure on the handle of wrench serves not only to twist the pipe but also to tighten the grasp of the pliers.

How a Famous Aquarium

Above is shown the magnificent Shedd Aquarium of Chicago, a $3,500,000 gift from the late John G. Shedd, prominent merchant.



Among the strange sights of the aquarium is the mysterious walking fish, shown at the right. Known as "Anabas Scandes," it hails from the South Seas.

Most attractive to visitors is this Japanese room of Shedd Aquarium.

THREE million eight hundred and eighty thousand visitors passed through the exhibition halls of the Shedd Aquarium in its first year—just completed—and somewhere on their rounds a surprisingly large percentage of them asked why their pet goldfish failed to prosper and live happily as our thousands of far larger specimens appear to do.

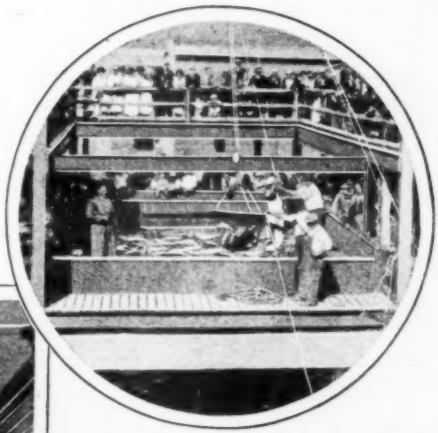
The occasional visitor who is admitted behind the scenes in any public aquarium sees the answer. The lesson happens to be especially conspicuous in the Shedd Aquarium, for ours is the largest, best equipped and most complete of the world's thirty public aquariums. Of those thirty, eight are in North America, and two of the eight in Chicago.

The huge white marble Shedd Aquarium, a gift of the late John G. Shedd, Chicago merchant, cost $3,500,000 to build and equip. It is the farthest inland salt water aquarium in the world. With its 132 exhibition and 86 reserve tanks it leads all in size and people familiar

Keeps FISH in HEALTH

by **WALTER H. CHUTE**
Director, John G. Shedd Aquarium
as told to J. EARLE MILLER

Visitors to the famous John G. Shedd aquarium in Chicago are amazed by the striking displays of odd fish from all parts of the world. This article explains what goes on behind the scenes, and tells also best methods for caring for goldfish.



Capturing fish at the million dollar Atlantic City pier. Aquarium collectors have first choice to obtain rare specimens.

Fish brought to the aquarium travel in first class comfort. Above is shown interior of special Pullman car, equipped with water circulating systems, electric aerating pumps, and refrigerating system.

Fish collectors are here seen loading a 250-lb. jew fish for transportation to Shedd Aquarium. Valued at $500, it made most attractive exhibit.

with other aquariums say it is the most beautiful in the world.

But, getting back to your goldfish and why they die. We, too, have our losses, but seldom in the goldfish department, for the goldfish, belonging to the common carp family, is a hardy swimmer and under proper conditions should live to a ripe old age. Our mortality rate of sixty per cent a year is mainly among the rarer, more delicate fishes, most of them transplanted far from their native ocean and unaccustomed to the restrictions imposed by small exhibition tanks.

Hog Fish Change Color Constantly—Sea-Mouse Crawls With Odd Fins

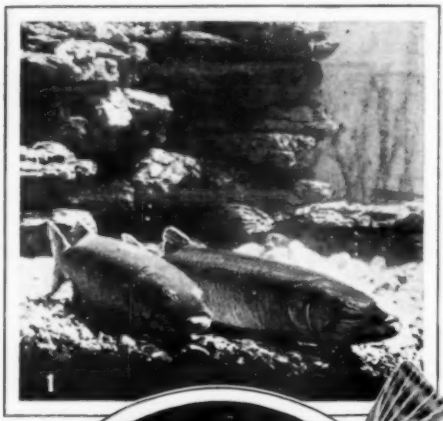


Photo 1—A pair of young muskies in their aquarium home. Photo 2—Strange "mouse-fish" found in tropics.

Your goldfish, if given plenty of water and air, sufficient but not too much food, and protected from sudden temperature changes, should live as long as do ours. Insufficient water and sudden temperature changes when more water is added kill most goldfish in private aquariums. A goldfish should have one gallon of water for each inch of his length, exclusive of the tail. If he measures two inches from nose to the base of the tail he should have two gallons, and so on. If you want to keep ten-two-inch fish you need a twenty-gallon tank. But ten growing fish in a twenty-gallon aquarium will soon grow enough to overcrowd the water.

Cold water from the tap should never be added to the tank or globe. Draw the water twenty-four hours in advance and let it sit and "age" while it acquires room temperature. Never change all the water at one time. Dip out a portion and add an equal amount of new water. If you chill the fish by adding cold water, spores of a fungus growth, always present in the tank, will be able to attack the fish and they will soon be covered with a white growth looking like cotton batting. Unless treated in time they will die.

Next to cold water, lack of air accounts for most goldfish fatalities. An aquarium should have the largest possible surface

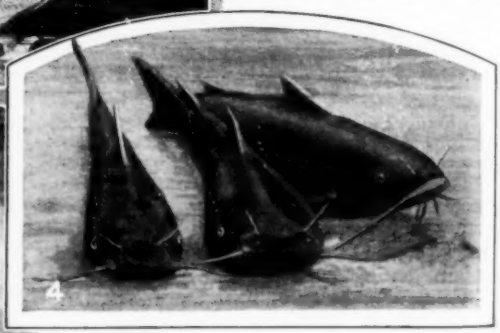


Photo 5—This 500 pound monster, known as a sea cow, captured off Florida coast, is harmless and lives on marine plants in its aquarium tank.

Photo 3—A pair of "hog fish" so named because of the somewhat porcine profile of the head. To despair of artists, they are constantly changing colors and patterns. Photo 4—Mississippi catfish, common in American rivers.

exposed to air. A round globe with a small neck therefore is not as good as a square or oblong aquarium built up with slate bottom, glass sides and metal frame. When fish have exhausted the oxygen in the water they come to the surface to suck air. Aeration by dipping up some of the water and pouring it back from a height of a few inches, or pouring in fresh water warmed to room temperature will relieve the shortage.

The best plan, however, is a balanced aquarium which can be operated indefinitely without changing the water. The name balanced aquarium comes from the fact that living water plants are planted in it in sufficient quantities to release in the water all the oxygen the fish need and to absorb out of the water the carbon dioxide given off by the fish. Growing water plants do those two things and in a balanced aquarium, in which care is taken not to foul it with uneaten food, it is only necessary to replace the water lost through evaporation.

Our Japanese room, containing scores of species of small tropical fish and gold fish, is a balanced aquarium. Hundreds of amateur fish growers visit it for ideas. Tropical fish in recent years have rapidly displaced goldfish as the most

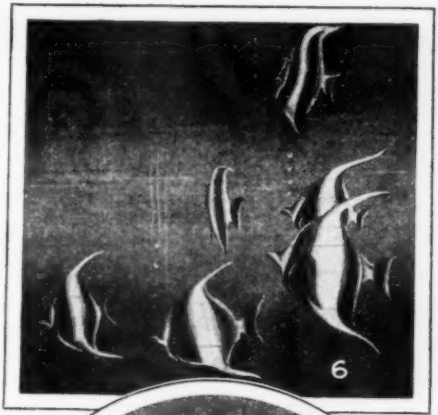
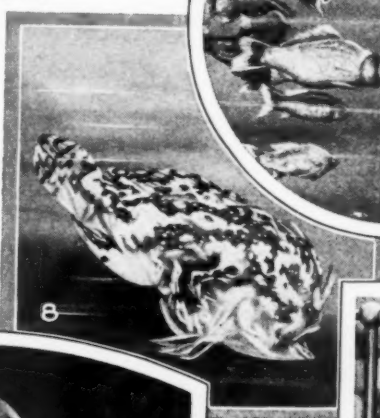


Photo 6 — From tropical waters come these odd "Unicorn fish." Photo 8 — The long-horned sculpin, with its mouth stretched out in diabolical grin.

Photo 7— Goldfish at aquarium.



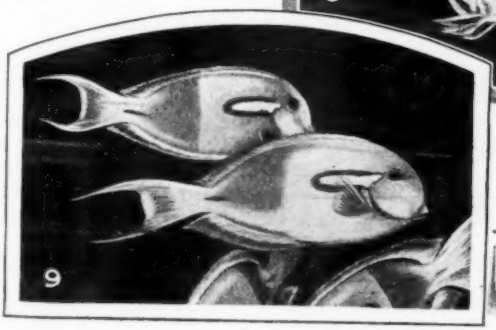


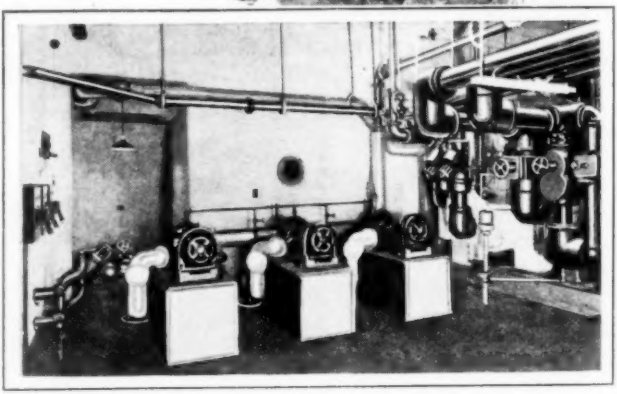
Photo 9—"Kihikihis" or "Moorish Idol" fish, imported from Hawaiian waters, said to be the most strikingly colored of any fish ever brought into this country. Center—sea lion. Photo 10—A sea catfish, one of the most ferocious denizens of the sea. Here you see one biting an iron ring. Living on oysters and other shellfish, it develops powerful jaws and is the bane of fishermen in Icelandic waters.

Hatchery Produces 45,000,000 Pike Annually to "Plant" in Streams

Above photo shows hatchery room at famous Lincoln Park Aquarium in Chicago, which produces nearly 45,000,000 pike annually for planting in Illinois streams. Right—Planting young wall-eyed pike in the grassy swamps along the Fox River, northern Illinois.

popular species for home aquariums among the real fish fanciers. Their charm lies in their color and the fact that they can be bred in small aquariums, whereas goldfish cannot.

Operating the largest aquarium in the world, nearly a thousand miles from the nearest salt water, is a complicated task. We carry in our tanks a million gallons of salt water, gathered at Key West and shipped to Chicago in more than 160 tank car loads. It cost $50,000 to deliver the salt water to Chicago, and we expect to use the same water for the next twenty-five years. Losses from evaporation, amounting to a thousand gallons a day, are made up by adding fresh water from Lake Michigan.



A part of the extensive pumping equipment at Shedd Aquarium which conditions water for fish in the display and storage tanks.

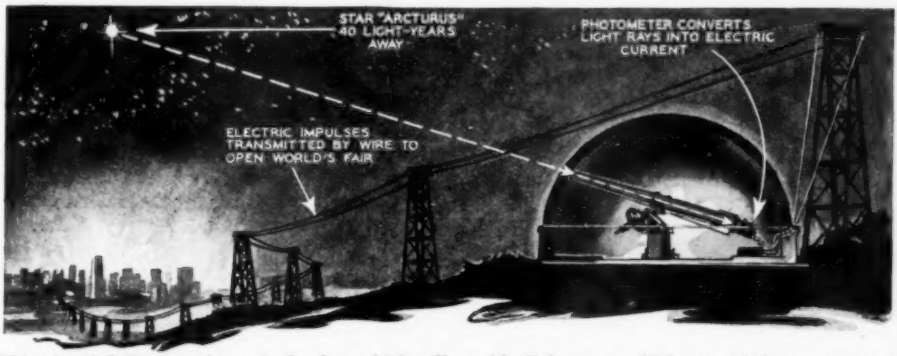
We own the only Pullman fish car in the world, which was built to my designs in the Pullman company shops. One end contains quarters for six fish collectors. The rest of the car is devoted to fifteen big fish tanks, twice that many large fish cans, three circulating water systems, with electric pumps, an electric air compressor to aerate the overcrowded tanks, and an electric refrigeration system to cool the water when we are transporting fish from the northern ocean or fresh water fish from northern rivers and lakes.

On our first trip from Florida we lost seventy per cent of our fish, but while that was happening the chemist studied the chemical changes in the water to see what was causing the high mortality rate. On subsequent trips we experimented with chemical control, and gradually cut the losses down until on the sixth trip they were but ten per cent.

There are 25,000 known species of fish in the world, of which 6,000 are found in American waters. Our average exhibition includes around 230 different species, and

(Continued on page 190)

STAR Light to Start WORLD'S FAIR


STAR "ARCTURUS" 40 LIGHT-YEARS AWAY
PHOTOMETER CONVERTS LIGHT RAYS INTO ELECTRIC CURRENT
ELECTRIC IMPULSES TRANSMITTED BY WIRE TO OPEN WORLD'S FAIR

This pictorial diagram shows the hookup which will enable light rays, which started forty years ago from the star Arcturus, to turn the switch which will start the lights of Chicago's coming World's Fair.

A BEAM of light that left the star Arcturus in 1893, when Chicago was astonishing the world with its famous Columbian Exposition, will flash down the world's biggest refracting telescope on the night of June 1, 1933, and, through a system of light valves and radio amplifiers, turn the switch and start the lights of Chicago's coming Century of Progress world's fair.

Arcturus, a star of the first magnitude, happens to be just 40 light years—or 240,000,000,000 miles—away from the earth, so that the light arriving in June of 1933 left during the Columbian exposition. Also at 9 o'clock on that night of year after next it will be high in the heavens, just a little east of due south, in a favorable position for observation.

The big 40-inch refractor at Yerkes Observatory of the University of Chicago, located at Williams Bay, Wis., will be used to catch the beam of light from the star. Racing down the forty-foot tube, which, with its other moving parts, weighs 20 tons, the beam will fall on the sensitive eye of a photometer, containing a light cell so delicate that even the air in the sealed compartment around it has to be dried by pumping it through sulphuric acid, to keep moisture from getting through the delicate glass walls of the electric eye.

Converted by the cell into electric impulses, the light wave, passing through radio amplifiers, will be sent by telephone wire to Chicago, 90 miles away, and there amplified again to work the switch controlling the fair lights.

Wooden Balls Speed Cycle Races

LES BLAKEBOROUGH, the well known English dirt track motorcycle rider, has recently invented an entirely new back wheel for his racing machine, which consists of a series of large wooden balls mounted on the rim in place of the conventional pneumatic tire.

The inventor claims his device makes broadsiding more rapid, and also makes it possible to broadside on hard surfaces.

Les Blakeborough with his motorcycle fitted with the new rear wheel which takes the place of the pneumatic tire in dirt track cycle racing.

Rubber Tires for Crawler Tractors Prevent Turf Damage

Rubber covered tires for crawler tractors enable machines to crawl over irregular surfaces, making full contact with ground.

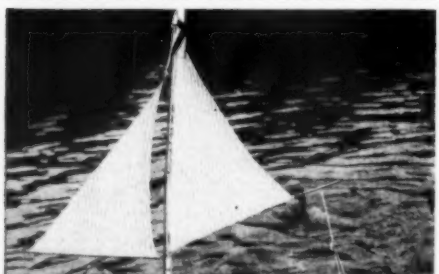
RUBBER tires for crawler tractors, recently introduced, now make it possible for these heavy engines to ride over parks, golf greens, lawns, or other sodded areas without in any way injuring the turf. Each track or side of the crawlers operates independently of the other, making it possible for the machine to pass over irregular surfaces and permitting full contact of the rear crawlers with the ground at all times. In addition, all noise is eliminated.

Human Body Is Museum of Relics

A WALKING museum of relics out of the past is the description applied to the human body by an eminent British naturalist. The body contains hundreds of such relics, left over from former stages of evolution. Biologists call them "vestige organs," like the human appendix. Another relic in the bodily museum is the set of muscles in the outer ear which enable a few individuals to twitch their ears slightly. The same is true of the muscles which twitch the scalp, still used by many lower animals to shake off insects.

Human Sailboat Swims at Ease

A HUMAN sailboat made his appearance at the recent diving tournament in London. To take advantage of each puff of wind, this water sports enthusiast attached a small sail to his middle, as shown in the photo below, and so equipped, he swims effortlessly.



Here is a human sailboat with small sail attached to his middle which saves arm propulsion effort.

Fire Fighters Play Poker in Flames

Protected by asbestos suits, Los Angeles firemen play cards in flames in demonstration of flame-extinguishing properties of carbon dioxide gas.

LOS ANGELES firemen have at last solved the problem of getting rid of kibitzers at poker who persist in looking over the player's shoulder. Clad in their asbestos suits, and using a deck of metal cards, the two firemen in the photo above sit down to have a quiet game while flames lick at their fireproof anatomies.

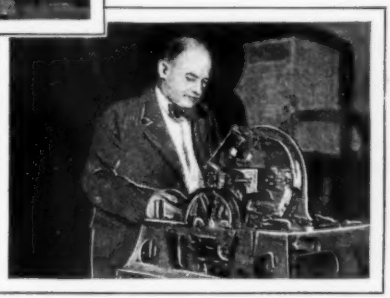
This novel game was part of a demonstration of Los Angeles firemen to show that carbon dioxide gas will "freeze" when coming into contact with flames, thus smothering the most stubborn blazes. Their asbestos suits gave them complete protection from the heat and the gas did its duty in putting out fire.

Making Relief Pictures is Easy Stunt

Above—Negative for reproduction. Right—finished print.

In the above group, at top left is seen original negative. At right is positive on film made from original negative. Below —finished print.

Above is shown fine example of relief effect on photo. Left—How the original negative is superposed on positive film.



This photo shows striking and novel effects that can be achieved by relief printing process, bringing out machine details.

ONE of the most striking and at the same time most novel effects that can be achieved in the amateur cameraman's darkroom is making photographs in relief—pictures that have the appearance of a plaque in relief.

The stunt is remarkably easy and costs practically nothing. First select the negative that you wish to reproduce, then make a positive print on another negative of the same size. What you will have then is a reversed negative, or a positive on film. Process film, obtainable at any photo store, is best for this purpose.

After you have the positive made and dried, place it and the negative together so that the two images come into almost exact register. Then adjust the films so that the negative image is a little—a very little—to one side of the positive. Finally bind the edges with thin strips of gummed paper.

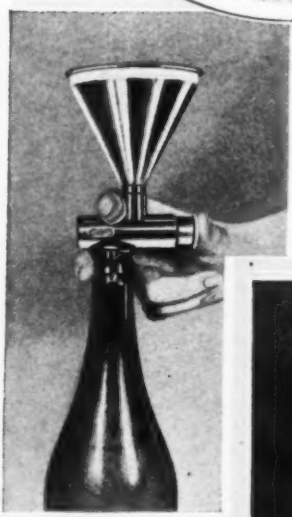
Next comes the printing of the negatives. A little experimenting will be required in determining the correct timing. Since the double negatives are denser, a longer period of timing will be required. When the job is finished, lo and behold, you will have a picture that seems to stand out in relief against the paper!

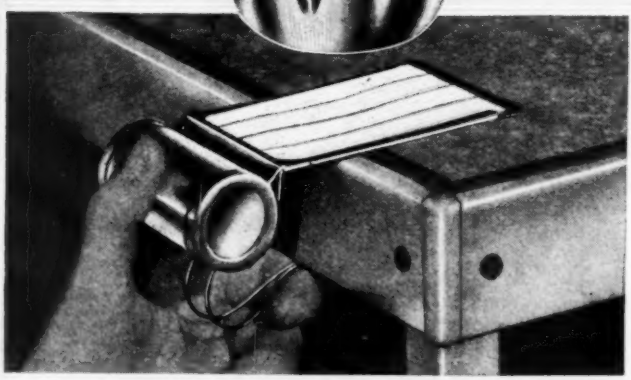
It might appear that the two negatives together would produce an opaque film. But offsetting the images overcomes this.

New Inventions Simplify

Enclosed in this rubberized casing, which exudes suds through perforations, bar of soap can be held firmly for ablutions. Right—Specially prepared paper, known as "Patapar," preserves juices when cooking.

This new rubber bottle cap seals the bottle on which it is used so tightly that it will withstand 50 lbs. per square inch pressure. Cap has central core with groove fitting over glass edge.

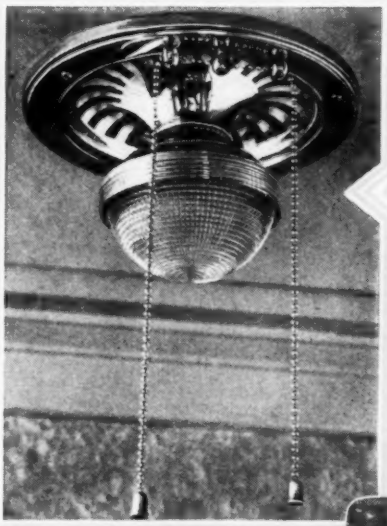




Pressure on the plunger of the new sugar meter shown above delivers into bottle correct amount of sugar, thus eliminating guesswork. Device works very rapidly and makes handy time saver for the busy housewife.

Handy for bridge players is this score pad in form of continuous paper strip, marked for recording, and unwinding from roll clamped to table.

Difficult Household Tasks



Combination ventilator and electric ceiling light shown above is latest in helpful bathroom fixtures. Placed above shower bath, device provides an excellent outlet for steam.

Handy new turnover pan shown here is especially suitable for making corn bread, warming rolls, frying omelets, etc. Pans are used either separately or as base and cover. Left—This hat tree and whisk keeps milady's hat in shape and holds hat brush in handy position. Brush at side holds talcum, which is released by pressing button.

This water power mixer, attached to faucet, mixes drinks, beats eggs, etc.

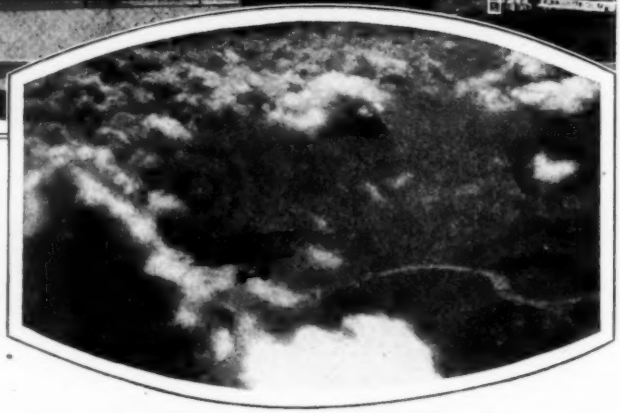
Having radium spots on base, this electric candle is easily found in dark and is lighted from small batteries in the holder. Low power bulb is turned on by switch.

Freak Winds—Sculptor and

This remarkable photo shows violent sandstorm approaching Big Spring, Texas, during afternoon of Sept. 14, 1930.

by IVAN E. HOUK

Strange things are seen in nature, but none stranger than the fantastic creations of freak winds, such as fish showers, moving sand mountains, explained here.



Airplane bucking upper air currents 10,000 feet above Dayton, Ohio. At this altitude wind had a velocity of 300 miles per hour, while only moderate breeze was blowing on ground.

"WHEN the wind blows the cradle will rock" is a part of the "Rock-a-by-baby" song which has crooned many a child to sleep. However, many other things besides the rocking of the cradle may happen when the wind blows, some of which may be dangerous as well as interesting.

In fact, some of them may cause the loss of a large number of human lives and the destruction of thousands of dollars worth of property. There have been cases where railroad trains were blown off of bridges and all the passengers drowned, not to mention the hurricanes of the south Atlantic and Gulf coasts and the death-dealing tornado, both of which have been known to destroy whole cities and towns.

Ordinary winds of from ten to twenty miles an hour rarely do any damage, but when the air moves faster than about fifty miles an hour things usually begin to happen. If it reaches a speed of five hundred miles an hour, as it does in some tornadoes, few works of man can withstand its destructive force.

Weather observers throughout the globe have been measuring the velocity of the wind for many years, using an instrument

Wrecking Crew of Nature

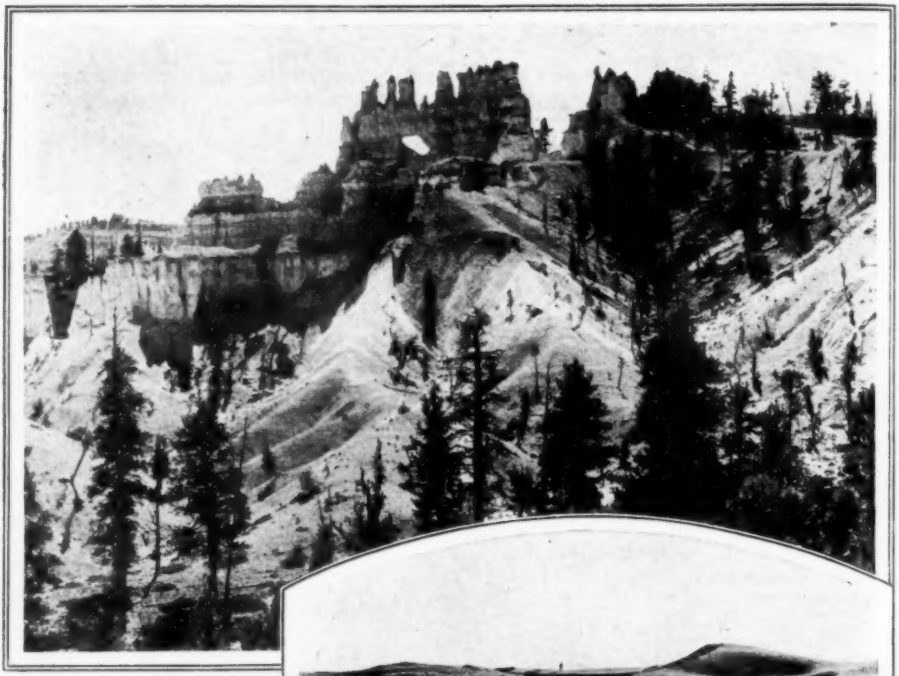
Destructive funnel and ominous low-hanging clouds of tornado are shown in this striking photo, taken near Gothenburg, Neb., June 24, 1930. Wind velocity in funnel was estimated at 500 m.p.h. by weather scientists.

These catfish were sucked up into air by tornado and rained down on a ranch in New Mexico in September, 1930, many miles from any lake.

Wind velocities at weather stations are measured by means of revolving cups of the anemometer, while direction of wind is indicated by the arrow.

with revolving cups called an anemometer. The principal trouble encountered in measuring unusually high wind velocities is that after the wind reaches a speed of much more than a hundred miles an hour the anemometer usually blows away, so that further measurements are impossible. During the Florida hurricane of September 18, 1926, the anemometer was carried away while the wind was blowing about 120 miles an hour, although a speed of about 132 miles an hour had been indicated a few minutes earlier. The greatest wind velocity observed up to the present time was recorded at Nassau a little more than a year ago, where a measurement of 164 miles an hour was made before the anemometer loosened from its moorings.

Thus far, no one has been able to measure the wind velocities which occur in the direct paths of the larger tornadoes. Experimental observations made during recent years, however, show that a wind blowing one hundred miles an hour exerts a pressure of ap-



Violent winds were the cause of these fantastic erosion effects seen in Bryce Canyon, Nat'l Park, southern Utah.

Wind movements in sandy areas cause sand dune formations which move slowly across landscape, overwhelming forests, buildings and other objects in their paths. Above is scene near Mexican border.

proximately 33 pounds per square foot on obstructing areas at right angles to the direction of the wind. Calculations made on this basis indicate that the maximum wind velocities within the more destructive tornadoes may be as much as five hundred miles an hour. City building codes usually specify a horizontal wind pressure to be provided for in designing important structures, the values specified usually varying from about twenty to thirty pounds per square foot.

Tornadoes, which are really gigantic whirlwinds moving across the country at speeds of from twenty-five to seventy-five miles an hour, cause the loss of many human lives and much valuable property each year. The seven tornadoes which occurred in the central Mississippi valley on March 18, 1925, and which constituted the most disastrous tornado experience on record, killed approximately eight hundred people and caused the loss of more than sixteen million dollars worth of property. The forty separate tornadoes which occurred in the southern states on February 19, 1884, and which constitute the record for the greatest number occurring in a single day, killed nearly two hundred people.

Weather observations show that the wind

(Continued on page 182)

Low Ceiling Cures "Auditorium Din"

SO RAPIDLY has the science of acoustics advanced that engineers were recently enabled to measure accurately the noises of the famous Madison Square Garden, recommend a new ceiling at a cost of $55,000 as a cure for the troublesome "auditorium din", and see their calculations work out perfectly.

The auditorium, large enough to accommodate a three ring circus, was full of annoying echoes and reverberations. Announcers at boxing exhibitions could not be understood. Their voices bounded from the walls and ceilings and reached the listeners in a jumble of unintelligible sound.

When acoustical engineers were called in on the job, they examined the great roof and the steel girders supporting it, and decided to hang a false ceiling under the girders and thus eliminate 2,000,000 cubic feet of space, an amount greater than New York's largest movie house.

After considering various kinds of acoustic material, they decided that a ceiling of one-inch rock wool blanket would be most practical. They hung 47,000 square feet of this material from the inverted T-beams of the roof, making a ceiling which acted as a huge damper to absorb the sound vibrations.

Engineers measured the reverberation after the work was complete and found that their standards and formulas had been correct. The time of the "garden" is now three seconds, or normal, for an audience of one-third its capacity.

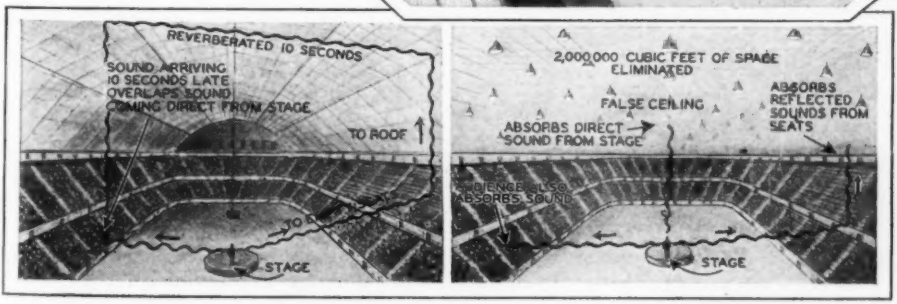
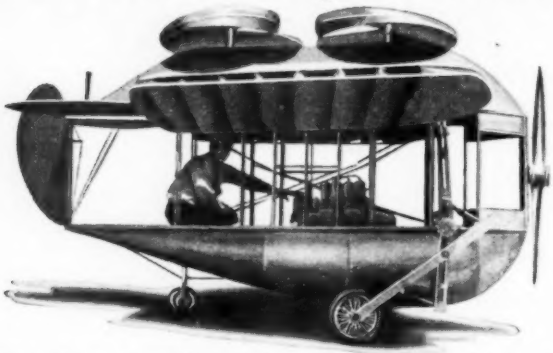

REVERBERATED 10 SECONDS
SOUND ARRIVING 10 SECONDS LATE OVERLAPS SOUND COMING DIRECT FROM STAGE
TO ROOF
STAGE
2,000,000 CUBIC FEET OF SPACE ELIMINATED
FALSE CEILING
ABSORBS REFLECTED SOUNDS FROM SEATS
ABSORBS DIRECT SOUND FROM STAGE
STAGE

Photo at the top shows the huge Madison Square Garden, with the false rock wool ceiling in place. Drawings below illustrate the effects of new and old ceiling on sound waves from speaker's stand.

Yet Another Attempt to Defeat the Law of Gravity



Harry Cordy shown above at the controls of his new helicopter.

THE recent success of the Cierva Autogiro has brought forth a deluge of attempts to defeat the law of gravity. Harry Cordy, a Los Angeles inventor, is about to introduce into a startled aviation world a model of his idea of just what an airplane should be.

This plane of the helicopter type is characterized by a new form of propeller which is said to produce a superior degree of lift and thus effect a true vertical takeoff or landing.

Inspect Wiring to Prevent Deaths

A CHILD killed by a defective socket on an electric extension cord, a woman electrocuted by a portable floor lamp and a bather badly shocked by a wash-rag accidentally electrified, are among recent accidents listed in New York City as part of a plea to every one to keep electrical equipment continually in good repair.

The baby was electrocuted because the key on the socket had become loose and made contact between the wire and the socket's brass cover. The baby creeping around the room, picked up the defective socket which was lying on the floor, and, at the same time touched the radiator.

The trouble with the fatal floor lamp was that a sharp edge inside the lamp cut through the insulation on one of the electric wires. While dusting, the victim accidentally touched this electrified lamp and a radiator at the same instant. The bather was shocked when a wet wash-rag touched the brass parts of a combined gas and electric fixture inside which the insulation had worn off one of the wires.

Cork Keeps Dust Off Camera Lens

Plug cork in hole to keep dust off the camera lens.

A SIMPLE scheme to prevent dust from collecting on a camera lens is to fit an ordinary cork into the lens hole as illustrated in the accompanying photo.

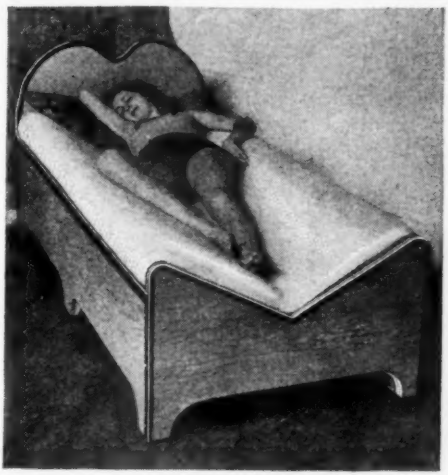
Machine Prevents Land Washing

Alternating shovels work up and down scooping out holes in field to prevent soil from washing away.

A NEW machine recently invented by government soil experts stops soil from washing away by jabbing the fields full of holes. Alternating shovels work up and down when the machine is in motion, scooping out the dirt and leaving holes at regular intervals. The machine leaves approximately 10,000 holes per acre, so that when rain falls it fills the holes instead of running off and taking soil particles with it.

New V-Shaped Bed Cradles Body for More Restful Sleep

A V-SHAPED bed recently invented supports the body perfectly at every point and thus promotes better rest. When unused the bed is straight like every other bed. However, one pull on a chain at the side of the bed immediately changes it to a V-shape. Another advantage claimed for the bed is that the covers are held substantially away from the person, thereby allowing the free circulation of air to the body.



Pulling chain at side changes bed into V-shape, supporting body at every point to promote rest.

Window Clock Has Changing Signs

Signs on this electrically operated clock change six times per minute.

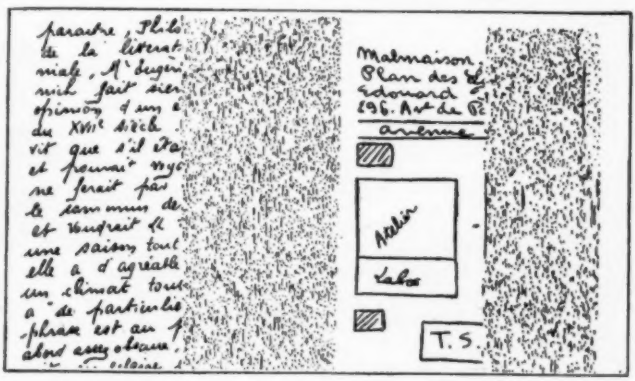
THE latest advertising stunt is a combination window clock and display panel which shifts signs six times a minute. Electricity lights the clock, operates the motor which changes signs and illuminates the advertisement. The device is especially suitable for display windows.

We Might Have Had Green Blood

IT MAY have been only an evolutionary accident that mankind has red blood instead of green, and pink cheeks instead of faces tinted like the leaves of trees, according to the theories of Professor H. Munro Fox of the University of Birmingham. Many millions of years ago, when the earth was a swamp, two sea worms existed. One kind had the beginnings of red blood and contained chemicals related to hemoglobin. The other worm varieties apparently had green blood. For some reason, however, it happened to be the red-blooded worms which developed the beginnings of a back bone and evolved, after millions of more years, into the higher animals and man.

Secret Documents Sent by Radio

M. BELIN, a French inventor, has perfected a machine known as the "Belinogram", which makes it possible to send by wireless with absolute safety documents of the most secret nature. The sending machine Belin has developed decomposes the message, document or photograph, while the receiver employed assembles the electrical impulses into the original form. Any other machine, although receiving the same document, finds the signals altogether distorted and of no value whatever.



At left, in above messages, is shown copy as it is picked up and recomposed by "Belinogram." At right—As they appear on other machines.

ROMANCE *with Efficiency*

by **RUSSELL J. MORT**

"SHE'S so light she can float on the morning dew."

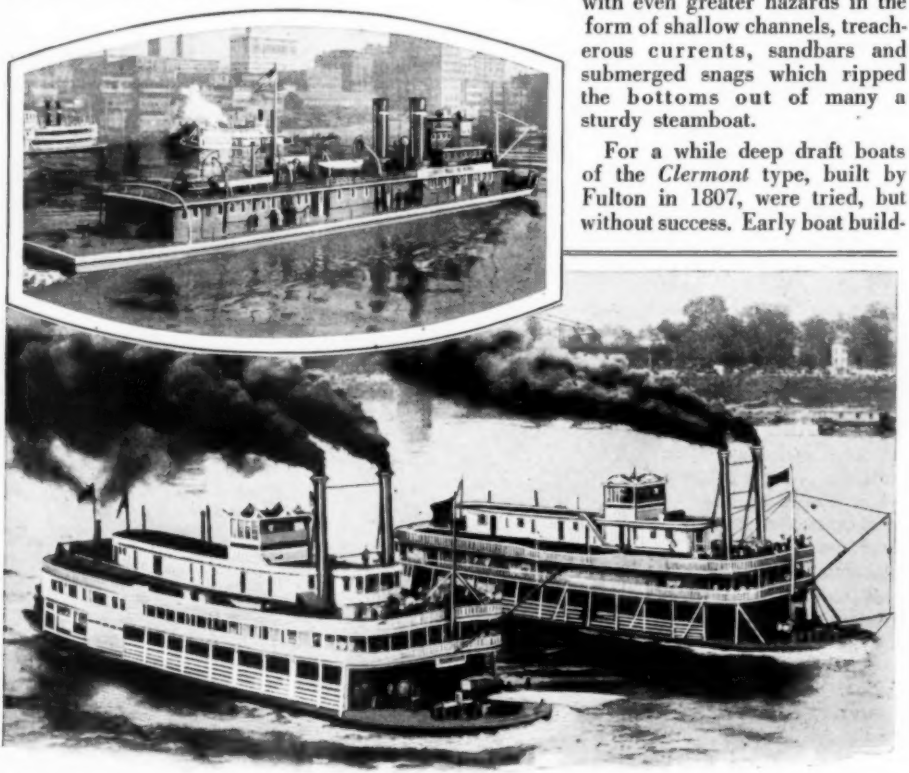
With these words, picturesque skippers, pilots and roustabouts described the palatial steamboats which plied the western rivers in the 'sixties, from St. Louis to New Orleans, from Pittsburgh to Memphis, bringing prosperity and romance to the middle west.

That day is gone, now, and the present sees a radically different type of vessel nosing its course up the inland waterways, a small, compact, business-like steamer of steel and iron, the latest product of modern mechanical ingenuity.

In the interim, engineering genius had been at work, stripping the magnificent old wooden steamboats of their ornamental jigsaw and filigree work, their five-toned whistles and their giant paddle wheels, and installing in their places wireless transmitters, metal hulls, twin screws and Diesel motors.

Before the coming of the railroads, steamboats were the chief means of access to the inland cities of America. At first, river navigation presented some tough obstacles. Unlike ocean-going ships, the steamboats did not have to battle mountainous waves and hurricane winds, yet they had to contend with even greater hazards in the form of shallow channels, treacherous currents, sandbars and submerged snags which ripped the bottoms out of many a sturdy steamboat.

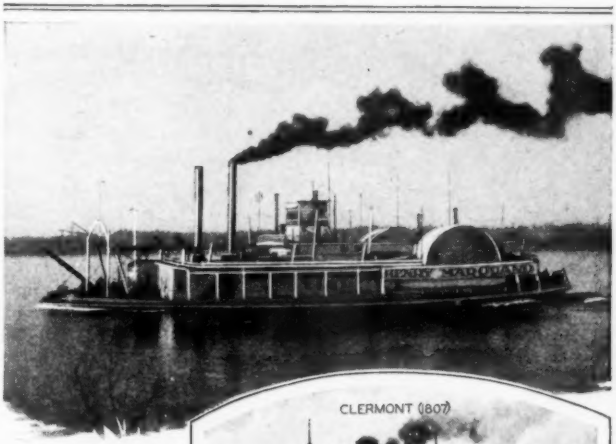
For a while deep draft boats of the *Clermont* type, built by Fulton in 1807, were tried, but without success. Early boat build-



Many thrilling steamboat races were staged to settle the hotly disputed question of speed supremacy. Above is shown the "Chris Greene" and the "Betsy Ann" steaming neck and neck in their famous race from Cincinnati to Richmond. The "Chris Greene" won. Insert at top shows the latest in river boats, the "Natchez," of steel construction, with twin screws, powered by two 2,000 horsepower Diesel engines.

in New Steamboatin' Days

The picturesque wooden steamboats which once plied the rivers of America are slowly retreating to oblivion and in their places is appearing a new type of boat, powerful, efficient, non-sinkable—the latest creation of mechanical ingenuity. This article tells of the records established by old boats and describes improvements in engines and construction.

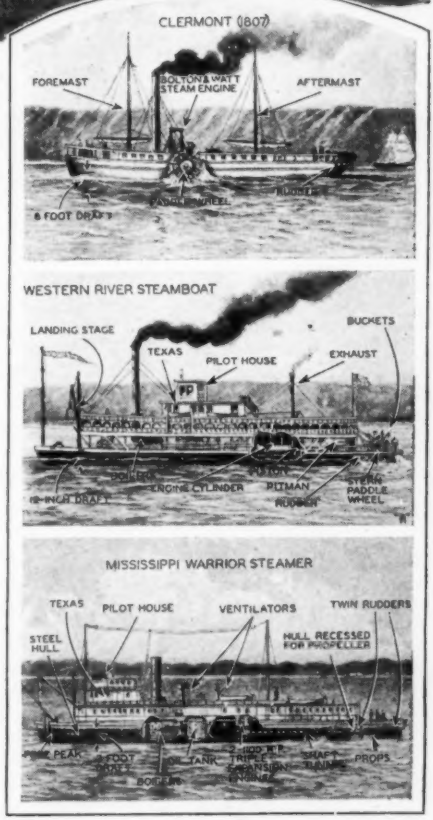


Above is shown the old "Henry Marquand," Mobile and Ohio transfer boat, an old style steamboat which holds its own against modern steamer.

ers like Captain M. G. Knox of Marietta, Ohio, and James Howard, of Jeffersonville, Indiana, who won wealth and renown for the strength and artistry of their creations, found that lightness and shallow draft were the chief requisites of steamboat construction. Accordingly, they adopted the keel boat, or flat bottom, type of hull and placed the engines and cylinders on the lower deck in a horizontal position, instead of upright, as in deep water ships.

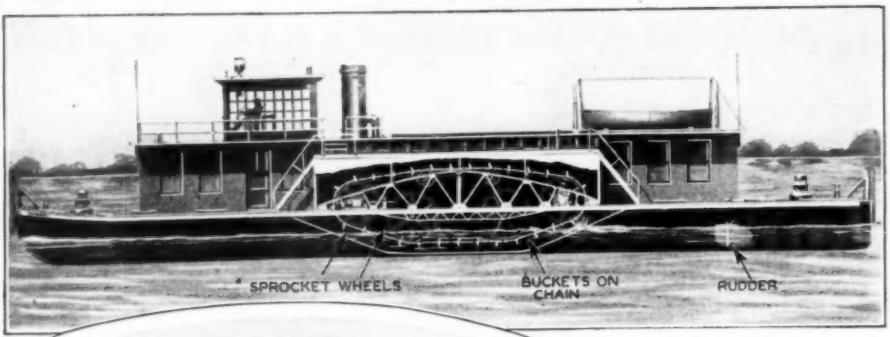
Giant pitmans connected the twin steam engines with the massive paddle wheels, which were found most satisfactory for shallow water navigation. Gripping the water with their great buckets, often fifteen feet in length and 35 to 40 feet in diameter, and turning at an average speed of 14 r.p.m., these wheels could send a steamboat scooting ahead as far as 125 feet at a single turn. Since the boats frequently had to maneuver in tight places, in narrow channels and alongside docks, each paddle wheel was individually driven by a separate engine, permitting the boat to turn in its own length.

Modern day engineering practice found the old wooden steamboats hopelessly inadequate for present day purposes. So ship builders set to work to construct an all metal boat of tremendous power. Old river men scoffed when the steel intruders floated

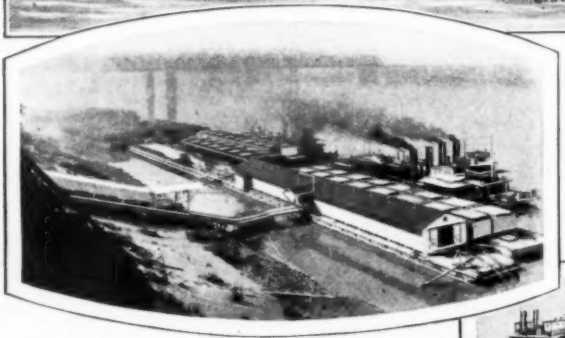


Construction of three outstanding types of boats are shown here. At bottom is seen "Tunnel Boat."

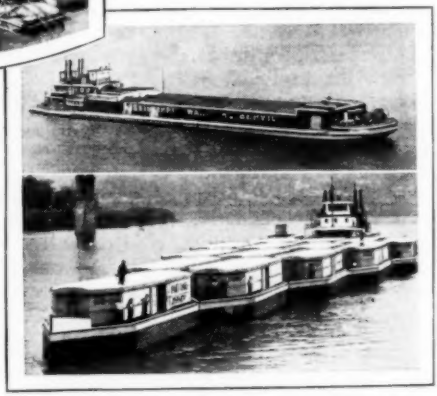
New All-Steel River Boats Have Two 1100 H. P. Engines, Twin Screws



This new type of river locomotive, embodying latest principle of propulsion, will haul freight out of Chicago on the Illinois River. High water traction with shallow draft makes the boat especially suitable for navigation of shallow rivers. Note movement of buckets over sprocket wheels.



Mississippi is now a thriving waterway, thanks to mechanical efficiency of modern steel barges. Above photo shows barge line docks at Memphis, Tenn., where boats take on cargo for river cities.



Top photo shows one of the new fast packet boats in Mississippi-Warrior service. Constructed entirely in steel, these boats are virtually non-sinkable. Below — V-shaped barges being pushed down the Ohio River by powerful tug boat.

forth upon the scene, and said that such boats couldn't make the grade. But they have been wrong. While the floating palaces of the early days have been retreating slowly to oblivion, the modernized steamers have been slowly building up a thriving business on the inland water-ways.

The new boats were especially designed by government engineers to carry bulky freight such as ore, lumber, grain and cotton between Minneapolis and New Orleans on the Mississippi, and between Birmingham, Mobile, and New Orleans on the Warrior river and Mississippi Sounds.

What gives these steel boats their great advantage over the steamboat is their stupendous pushing power. The paddle wheel has been replaced by the twin screw, making necessary the adoption of the tunnel type stern from which the vessels get their names, the "tunnel boats". In the powerful little towboats in most widespread use, two 1,100-h.p. triple-expansion engines are employed to drive the twin screws.

With a draft of seven feet, a length of 200 feet and a beam of 40 feet, the towboats can navigate the larger rivers with perfect ease. Their steel hulls remain intact under the strongest blows from submerged snags, often struck in the shifting channels. Nothing, in fact, can stay the progress of these steel monsters as they nose their ways up the rivers, pushing ahead of them as many as seven or eight steel barges, each carrying an average of 1,800 tons of freight. Record tows of 16,000 tons have been

Old Steamboats Easily Hit Off 20 Mile Clip Up Stream; 25 Miles Down

driven up the river under power of these invincible vessels—loads which would have sunk a half a dozen steamboats.

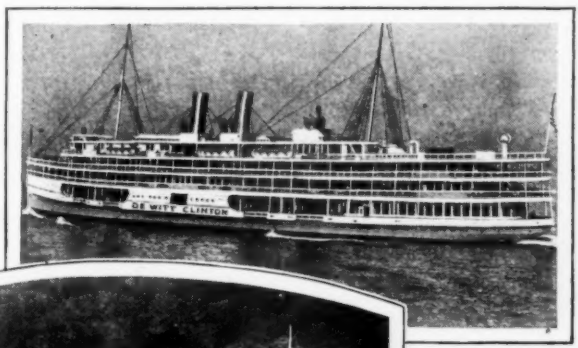
The coming of modern efficiency has knocked the adventure and romance of the old steamboatin' days into a cocked hat. In the 'sixties, when river travel was in its heyday, every boy's ambition was to become a pilot on one of the great boats that churned up and down the throbbing western rivers. Steamboats decorated with blazing gilt letters, filigree and scroll saw work, blowing for their landings with resounding five-toned whistles, stirred the imagination of the whole country.

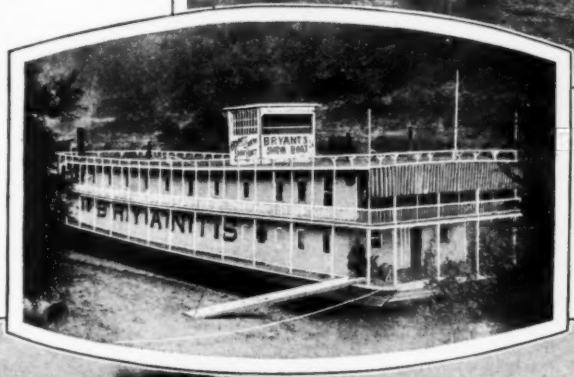
Old river men will tell you that the *Belle Lee* and the *J. M. White* were the two most beautiful boats on the river. Veritable floating palaces, with graceful, rakish lines, they had passenger accommodations to rival the best hotels, and were always kept spick and span by their proud skippers.

The *J. M. White* had an overall length of 325 feet, a beam of 50 feet, and her smoke stack, topped with a fancy crown, rose 75 feet above the hurricane deck. Elaborate decorative wood work distinguished her frame, while the great blue dome on her pilot house was known in all riverside villages from St. Louis to New Orleans.

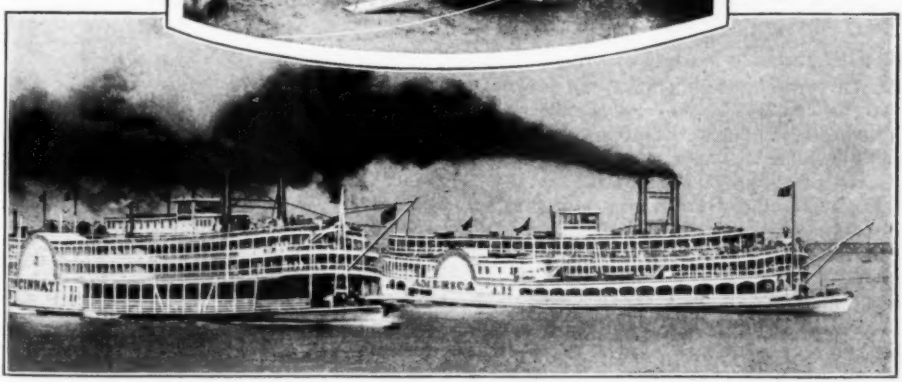
When it came to speed the *J. M. White* could outrun the best boat that floated. Drawing but four feet of water, and carrying as high as 8,000 bales of cotton on her lower decks and 500 passengers in her luxurious staterooms, she could easily hit off a clip of 20 miles an hour upstream and 25 miles downstream. Her arrival at a riverside town was a festive event.

(Continued on page 174)



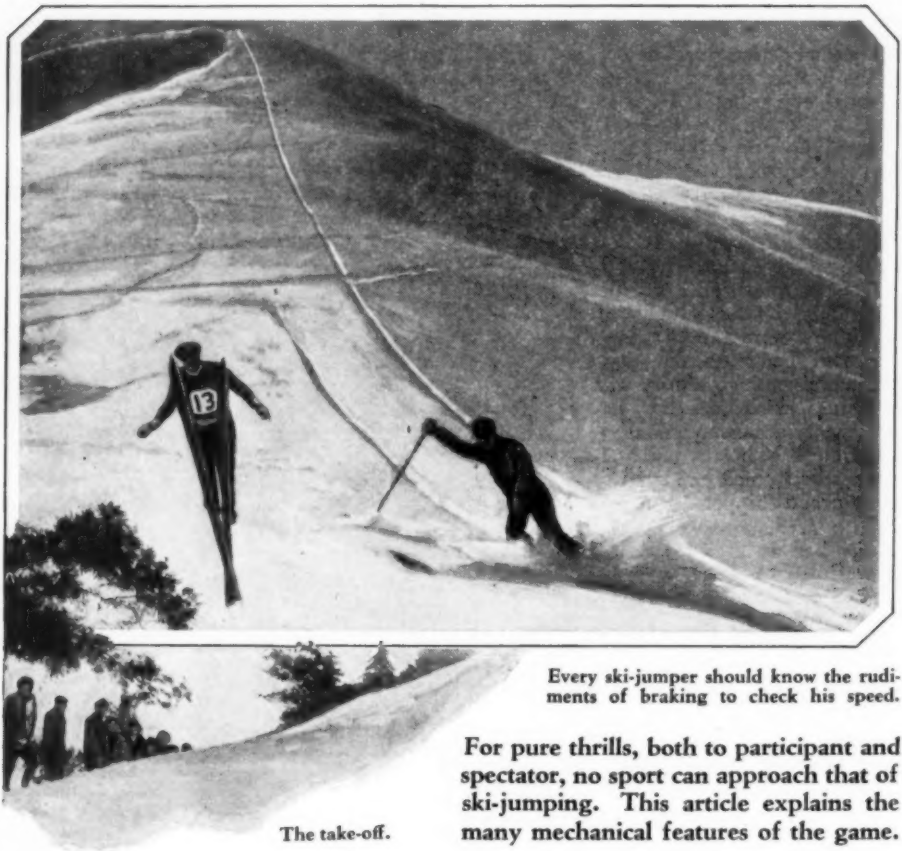


Above — "De Witt Clinton," modern Hudson river boat. Left —In early days of America, entertainment was brought to riverside towns by show-boats.



Above photo shows two old side wheelers still in service, the "Cincinnati" and the "America," racing to win speed honors on the Ohio River. "Cincinnati" forged ahead at finish line and won by 40 ft.

The MECHANICS of



Every ski-jumper should know the rudiments of braking to check his speed.

The take-off.

For pure thrills, both to participant and spectator, no sport can approach that of ski-jumping. This article explains the many mechanical features of the game.

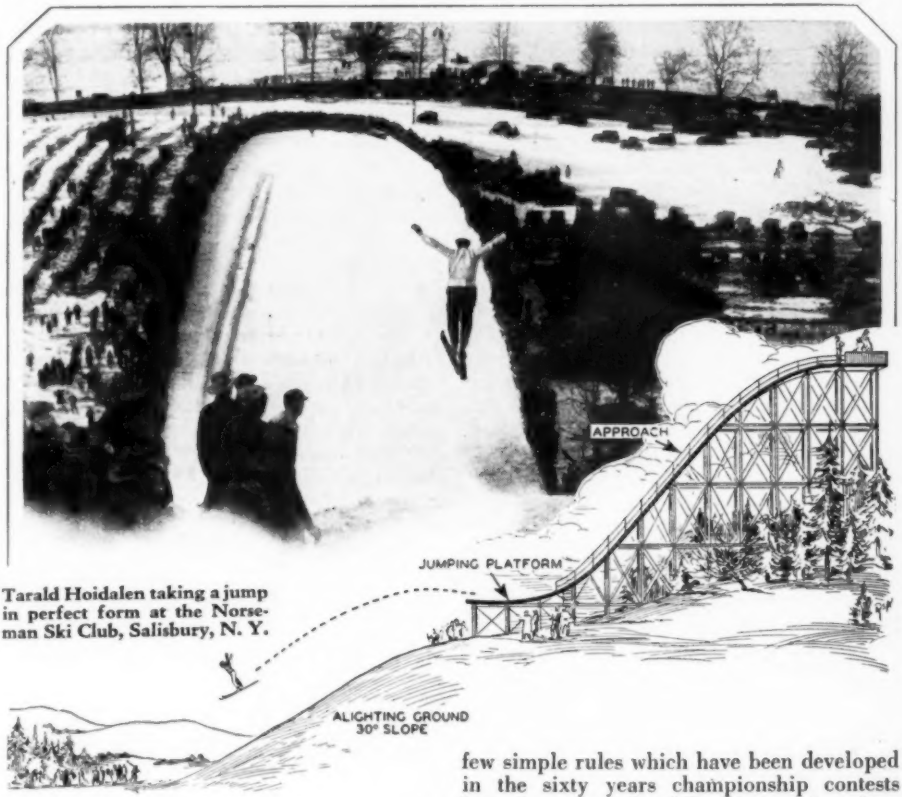
THE death-defying feat of slipping down an icy incline at a mile-a-minute clip, with a pair of slender wooden strips attached to the feet, clearing the take-off platform and hurling the body like a human meteor through space a distance of 100 to 250 feet, landing right side up and taking the applause of the thrilled spectators, calls for complete mastery of the mechanics of skiing.

Climbing the side of a preposterous mountain, which seems to shoot up straight toward heaven, the skier fastens his "wings" to his feet, poises at a giddy height. The clear notes of the starter's bugle is signal for the winged meteor to start slipping down the precipitous slope at express-train speed. Crouching slightly, to reduce the wind resistance he travels faster, ever faster, down the hillside pitched by nature at an angle of 30 or 40 degrees. In a flash he reaches the end of the runway—the take-off—and faces nothing but empty air! With a sudden snap he comes upright, body rigid, arms out, head proudly erect, like a bird soaring into the thin, cold air.

W-h-r-r-r-r! Skis parallel, with birdlike motion of arms to hurl him forward the faster, yet keeping his balance, he seems suspended in the air. Then down, down with the swift swoop of a startled eagle, he hits the snow on a downward slope and

SKI-JUMPING

by EARLE W. GAGE



Tarald Hoidalen taking a jump in perfect form at the Norseman Ski Club, Salisbury, N. Y.

speeds on like a bullet down to the level space at the end of the jumping arena. The snowy cloud enmantles the man from the view of the thrilled spectators, but the blur clears. Making a lightning-quick Telemark turn, facing the judges' stand, a deep silence hovers over the arena as the judges announce the distance, "Two Hundred and ten feet!"

The swift movement down the icy slide, the leap which quickly follows, and the hazardous flight through space culminated by the daring landing, is a breath-taking sensation unequalled by any winter sport. The men who make these leaps are the gamest of sportsmen. Traveling through space like an airplane, they must exercise utmost skill to avert serious injury.

Mastery of the art of skiing calls for a few simple rules which have been developed in the sixty years championship contests have been staged, while distinct American methods have been worked out in the thirty years ski-jumping has been in vogue this side of the Atlantic.

The beginner should first master the easy slopes, using the Telemark position so popular among professionals. In this one ski is held slightly in advance of the other, rear knee bent, skis held closely together, so as to make one wide track. Carry poles with points to the rear to avoid accident.

To get to the top of the grade in readiness for the jump, we use the herring-bone and travel faster than we could walk up. We turn the points of the skis outward, with the tips of the inside edges downward. One ski is kept slightly above the other. The wider the angle formed by the two diverging skis, the firmer the grip. By lifting each ski in turn over the other, the runner may

move straight up the slope as fast as energy permits. Lean toward the hill and plant the skis down firmly.

If the slope is very steep, use the "traversing" method. Head diagonally up hill, lift the upper ski forward and upward, then bring the other up beside it.

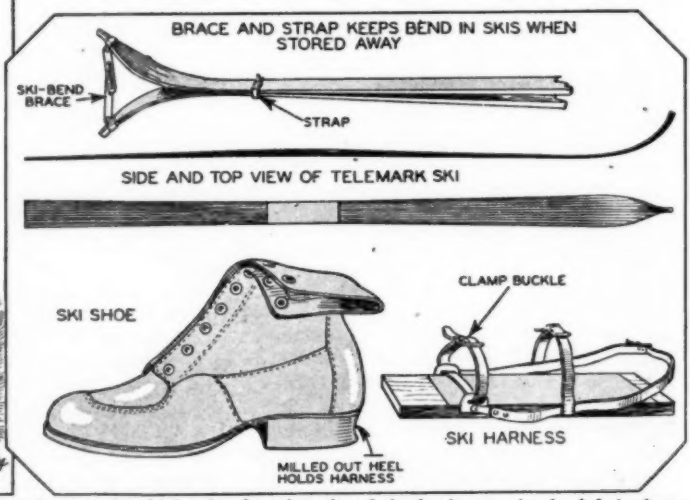
We need to have complete mastery in making turns at full speed ahead. The Christiania and Telemark turns are best. The latter is used in making right-hand swings. In this the outer ski leads in making the right turn; to make the left turn, push the right ski forward until the foot is opposite the point of the left ski. Then place weight on the forward ski, with the body inclined forward and the left knee bent deeply. Turn the right or leading ski inward, or "edge" it, and press sharply outward on the right heel. The leading ski will swerve to the left, followed by the unweighted left ski. Continued pressure brings the skier to a full standstill, facing upgrade.

In making the Christiania swing, the inner ski leads. Headed down grade, advance the right ski slightly. When you desire to turn, shift the weight quickly to the right ski, edge it and twist sharply to the right, leaning toward the hill, somewhat in the fashion of making a sudden stop in skating. Put the pressure on the heel of the ski. This turn is valuable for a quick swing on snow too smooth or hard-packed for the Telemark.

Every ski-jumper should know the rudiments of braking, since he travels at airplane speed, and may wish to make a stop to dodge disaster. The principal braking movements used to reduce speed are the "snowplow" and the Telemark. The first is performed by placing the skis with points together and heels separated as far as possible, making a letter "A". Both skis are edged inward, and the degree to which they are edged determines the braking effect. This leads to a turn, by simply shifting the weight to either ski, the skier is bound to follow that ski into a turn in the other direction. The right ski, being pointed outward, will run to the left if weight is shifted on it; the other is sure to follow.

Use the Telemark brake on the steepest slopes. Place one ski, edged inward across in front of the other, at right angles. The skier runs on the second ski with knee deeply bent and brakes himself with the first ski.

After we have erected a proper ski-jump-



Selection of the proper equipment should be the first thought of the beginner. At the left is shown how to secure a proper "fit" in ski-runners and pole. A ski-bend brace should be used when storing.

ing platform, or "take-off", we may consider the maneuvers of the jump. The ideal course consists of (1) the approach; (2) the take-off; (3) alighting ground, and; (4) the outrun. It is best to select a grade which faces other than the south to insure the sun not melting snow in spots. North or northeast makes an ideal slope.

The approach should give all speed necessary. The take-off should be level or sloping slightly down hill, and the angle from the approach to it should be gradual, not abrupt. Alighting ground should be 30 or more degrees steep. This should be measured as the degree of slope is important in making successful jumps and safe ones. The take-off can be made of piles of boughs covered with snow, or entirely of snow, or of planks covered with snow. The platform, or "take-off", should be located back from the edge of the slope.

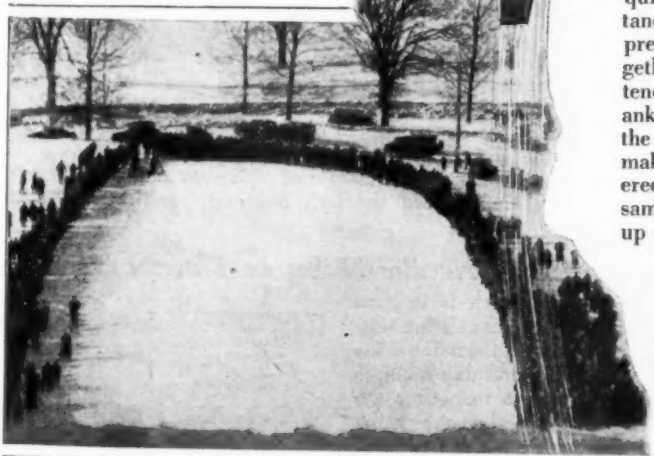
The arrangement should be such as to insure the jumper landing, not on level ground, but on the steep slope of the grade below the take-off. The alighting ground at the foot of the hill should gradually grow less steep until it merges into a safe level out-run where the jumper can swing to a standstill on level land.

It is well to remember that if jumps of 50 feet are to be made, the take-off platform should be from three to four feet high. The alighting ground should be all of 100 feet long for a 50-foot jump, with the snow packed moderately compact. By increasing the height of the platform and the length of the alighting ground, we may prepare for the longer jumps.

The correct position during run to take-off platform.

Everything set for the ski-jump, we go to the top of the approach. Making the jump consists of two important elements—spring and balance—which govern the form so prized in the finished jumper. Using the Telemark position, the skier bends quickly when a short distance from the take-off, pressing knees firmly together with the hands extended at the level of his ankles. Just before reaching the edge of the platform, he makes his leap by snapping erect and forward, at the same time swinging his arms up quickly.

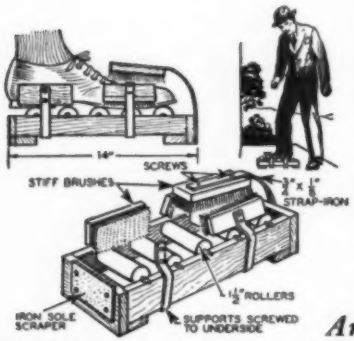
The heels should not leave the skis; the toes are pressed downward; the skis are held parallel, and the body is inclined forward as the jumper takes to the air. In landing, the skis should be held together, and the knees bent slightly.



Harold Soerensen at the height of the jump that won 1930 championship.

HANDIKINKS

Handikinks department brings to you a number of helpful little stunts and ideas that will aid you in the performance of tasks about the house, in the workshop or garden; in fact, any place where there's work to be done.

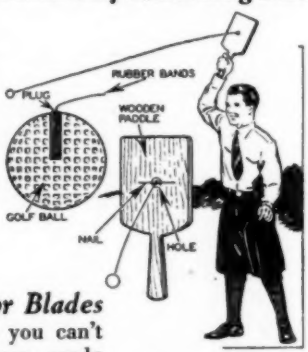


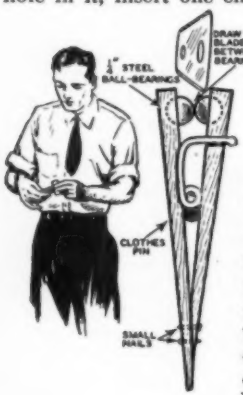
Handy Device Cleans Shoes Automatically

IT'S NO trouble at all to clean your shoes with this simple little cleaner—all you do is just slip your shoes into it and they come out clean. Five 1½-inch rollers are mounted on the top of the box as shown in the accompanying drawing. On five strap iron supports are mounted as many stiff bristle brushes, so placed that they rub against the shoe when it is inserted. To remove mud from the sole, an iron scraper should be screwed to the end of the box. The whole shoe is is thus quickly and thoroughly cleaned in one operation.—Don Aggan.

Amusing Paddle Game Has Self-Returning Ball

THE latest in games is this paddle and golf ball stunt. The self-returning golf ball is made by attaching it to a long rubber band, which is in turn attached to the wooden paddle as illustrated. In attaching the ball, bore a small hole in it, insert one end of the band, and then plug the hole with a match. No matter how hard you smack the ball it always comes back for more. A tennis ball may be substituted for a golf ball if you like.—Jason Dubor.



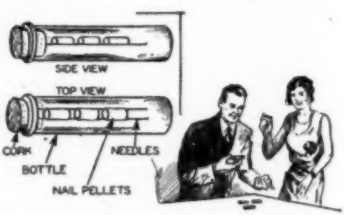


Ball Bearings Sharpen Razor Blades

FOR whetting old razor blades you can't beat this ball bearing sharpener, made simply from two steel balls set into the end of a clothes pin. It is necessary first of all to gouge out a small well in the end of the clothes pin members and set in each a ¼-inch steel ball as illustrated in the accompanying drawing. Next nail the ends of the clothes pin together with a couple of cigar box nails. To sharpen draw the blade between the ball bearings as illustrated.—Bob Poulson.

Putting Nail Pellets on Parallel Needles Makes an Entertaining Game

TWO needles stuck into a cork, which is in turn placed in a small perfume vial, makes an interesting game for parties. The point is to get the nail pellets to lie end to end on the two needles, and this requires a lot of skill. The best method is to maneuver the pellets in an end to end position directly beneath the two parallel needles, and then with a sudden twist of the hand make them fall into place, as illustrated in the accompanying drawing.—Louis Miller.



Helps to Lighten Household Tasks

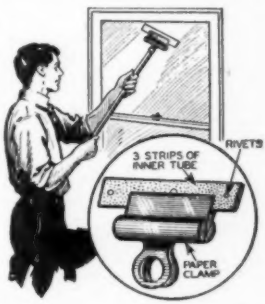
Fiber Grip on Light Chains Prevents Shock

THERE is a certain element of danger in handling even the best bathroom light fixtures with wet hands. To eliminate this hazard, it's a good idea to insulate the handle in some way. An excellent method is to attach to the end of the chain a short piece of fibre, cut to the shape shown in the accompanying drawing.—Blake Enders.

Squeeze Bulb Makes Catsup Pouring Easy

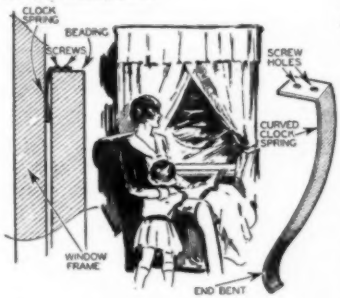
POURING catsup out of a bottle need be no laborious task if you use this simple stunt. A rubber bulb inserted in a two-hole stopper is squeezed and catsup is forced out of the bent glass tube in an even stream. It is important that the two tubes extend down into bottle to depth shown.—Ralph Daigh.

Handy Home Window Cleaner From Inner Tube



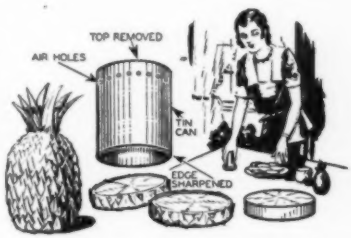
A WINDOW cleaner of the type stores use to make windows crystal clear can be easily made from an old inner tube, a paper clamp, and three rivets. Three strips, each 6 inches long by 1½ inches wide, are first cut from the tube and bound together by a rivet at each end and in the center. This triple rubber strip is then placed between the jaws of the clamp as shown in the drawing at right. Finally, a broomstick is screwed or nailed to the handle between the rings and the cleaner is ready for action. For house windows it will be found ideal.—Louis Andrews.

Prevent Window Rattle



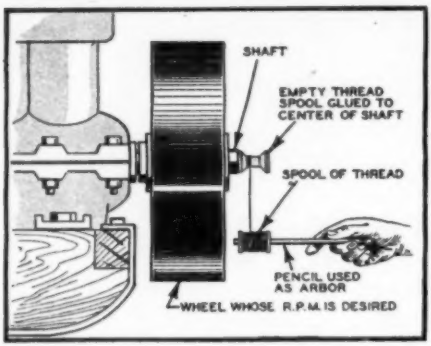
ANNOYING window rattles may be stopped instantly, without impairing the raising and lowering motion, by means of a seven-inch length of clock spring cut from the core of the spring so it will have a pronounced curve. One inch of the end is bent L-shaped and bored for screws. To attach to the window, push outward and take up the play. Flatten the spring against the window and slide it sideways into place, then screw the L-shaped end down with two wood screws. When the wind blows the springs will brace the frames against the pressure.—Thomas Moore.

Tin Can Makes Handy Pineapple Cutter



THE task of peeling pineapples may be made considerably easier by employing these tin can cutters. The tops of the cans are first removed by heating them upon the stove. Air holes are then punched around the base of the can as illustrated, and the cutting end sharpened. After the pineapples have been sliced, they are cut into cookie form by means of the can. For different size cuts use various sized cans.—G. E. Hendrickson.

Labor Short-Cuts for the Workshop

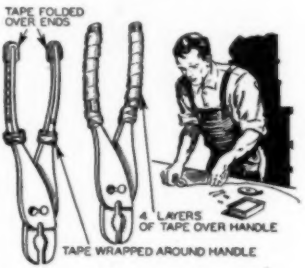


Revolution Counter From Spools

THE means whereby revolutions can be counted are many and complex, but here is a substitute counter that beats all for simplicity and efficiency. The scheme makes use of an ordinary thread spool, which should be glued to center of the engine shaft. A thread from a full spool is wound around the shaft spool, as illustrated in the accompanying drawing. By timing the number of turns the engine makes in ten seconds (which is found by unwinding and counting the turns) you can determine the revolutions made for one minute by multiplying by 6.—Weston Farmer.

Insulate Pliers Handles to Prevent Shocks

THE ordinary slip joint combination pliers may be insulated with friction tape as shown in the accompanying drawing to save the user from annoying shocks. When the tape has been wrapped on tightly, rub tire talc well into the outer layers to prevent stickiness.—R. C. Bradbury.



Well in Iron Tip Makes Soldering Easier

YOU'LL find soldering a much easier job if you utilize this little kink on your iron. Drill or file out a small, shallow well or cavity in the tip as illustrated in the drawing at the left. Tin your iron good and when soldering wires together fill the well with solder. By this means the iron will hold a bigger lump and enable you to handle much more material before taking up the lead again. Of course flux should be properly applied to the wires for the best results, and the iron should be raised to proper heat. Keep well up when heating.—James Gonger.

Lawn Mower Wheel Makes Handy Tool Rack

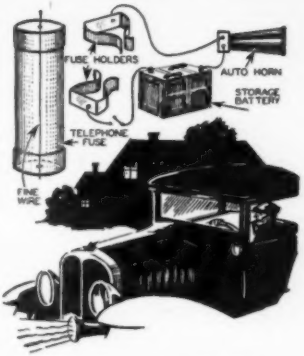
AN OLD lawn mower wheel of large diameter with open spokes and reinforced cast-in center ring may be made in a handy revolving small tool stand as illustrated in the drawing at the right. The upright is mounted on the baseboard in any convenient manner and the wheel set atop this upright and held in place by means of a long wood screw. Tools are held handily in place between the spokes. —Lester P. Young.

Grinding Wheel Motor From Old Sewing Machine

AN OLD sewing machine that has been thrown into the junk heap will make as fine a "motor" for a grinding wheel as you could want. The business end of the machine is removed, leaving the shaft from the pulley wheel exposed. To this is attached a grind stone, which is slipped on after the bushing, as demonstrated, and held in place by lock nuts. A shaft plate should be secured on the end to hold the shaft rigid and prevent wabbling. The stone gets its turning power, of course, from the pedal.—Paul Hadley.

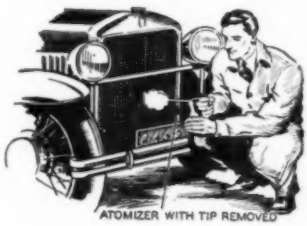
Stunts for Motorists' Convenience

Telephone Fuse Makes Auto Thief Alarm



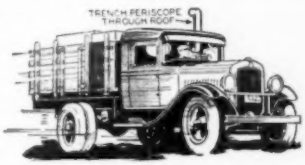
HERE'S an auto thief alarm that will raise the dickens when a thief tampers with your machine. The heart of the alarm is an old telephone fuse, which has a 1/16 inch hole in one end. Inside the opposite end is soldered a straight piece of steel hair wire. When inserted in holder and wired as shown at the right it will blow the horn when the engine is started. A secret switch turns off the juice when you're in the car.—Thomas Moore.

Repairing Radiator Leaks With Old Atomizer



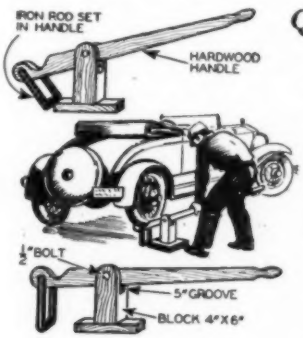
AN OLD nasal atomizer with the tip removed and some liquid solder made from clear celluloid lacquer to which is added a little aluminum or gold bronze powder will stop leaks in your radiator in a few minutes. First drain the radiator, then let it dry thoroughly. Now press the atomizer nozzle against the leaky parts and spray on the solder. Let it dry and you will have a metallic coating that will stop the leaks effectively.—A. H. Waychoff.

Periscope Gives Rear View for Truck Drivers



FOR trucks on which a rear view is impaired by a wide body, an old rear-view trench mirror, obtainable at any army store, will solve the problem. A hole is cut in the roof in the position shown and the periscope fitted in position so that the viewing end comes in front of the driver's seat.—John E. Hogg.

Quick Action Jack for Home Garage Repair Jobs

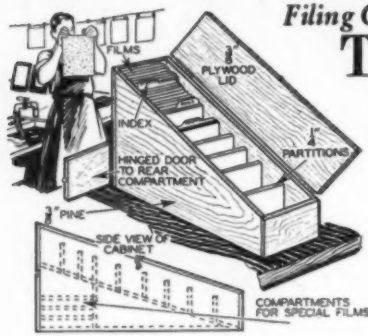


ESPECIALLY handy for use in the garage is this quick action tire jack, which has a lifting capacity large enough to raise any car. It consists of a hardwood handle 3½ feet long mounted in an upright as illustrated herewith. An iron rod of the shape shown and ¾ inch in diameter is set in the end as a support once the car is raised. Jack in position for raising car is shown in the top drawing at the left.—Robert Poulson.

Vulcanizer From Electric Iron

AN old electric iron can be pressed into service to make an extremely efficient vulcanizer. For vulcanizing jobs, the iron should first be mounted in a vise. Then clean, cement and patch the tubes in the usual manner, and cure them for a few minutes in the improvised heater. It is advisable here to dust the iron with powdered soapstone before clamping down on the tubes. Leaks in hot water bottles, gloves, and other household articles may also be successfully vulcanized with this scheme, which eliminates the possibility of patches coming loose.—Philippe La Fee.

A Page of Ideas for Handy Men

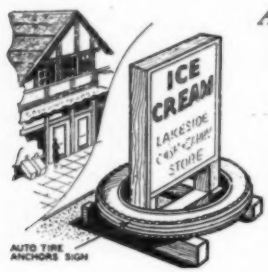


Filing Cabinet Makes Negatives Instantly Available

THE business of trying to find a certain film among two or three hundred others is always a nuisance. By keeping them filed and indexed in an orderly manner the desired film can always be located at once. The cabinet shown at the left is just the place to keep your pictures in order, for it will accommodate several hundred negatives, with compartments for various groups, such as sports, dogs, excursions, family, scenery, etc. The width and height of the box depends upon the films to be stored. White pine for box and compartments, and plywood for lid and doors are suitable materials.—Hi Sibley.

Tie and Belt Hanger From Coat Hanger

AN OLD wooden coat hanger, equipped with hooks as illustrated in the accompanying drawing, will do very efficiently as a holder both for ties and belts. Select a wooden hanger of the shape shown and punch holes along the crosspiece. Into these place, with a driving fit, ten hooks made from stiff wire, bent up and pointed as illustrated. Ties are hung over the crosspiece, while belts are hung from the hooks. In case you have no wooden coat hanger available you can cut a wooden crosspiece and attach it to the end of the shoulder section on a wire hanger.—Gilson Willets.

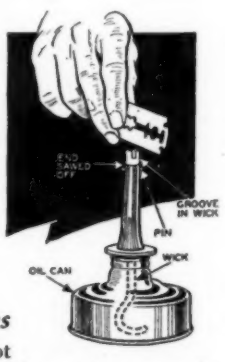


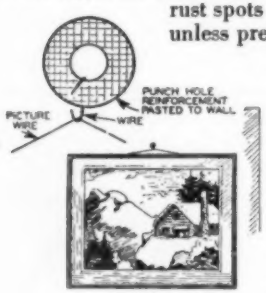
Auto Tire Makes Sign Anchor

MANY storekeepers and service station men who have small signs in front of their stores are at a loss to know how to keep them from tipping over in the wind. Well, here's a remedy for the difficulty. Simply place the tire down over the sign so that it rests on the foot pieces at the base, and the wind will have to blow pretty hard before the sign will flop down.—Manuel Bondo.

An Oiler for Your Razor Blades

A RAZOR blade always works more smoothly when it is covered with a film of oil. It is an easy matter to keep it oiled if the spout of a small oil can is cut off and fitted with a round wick as shown in the accompanying drawing. The blade is drawn through a groove at the top of the wick, which is always saturated with oil. Microscopic rust spots are almost certain to form on the blades unless precautions are taken to prevent them. The best precaution is a film of good quality oil.—James Degas.

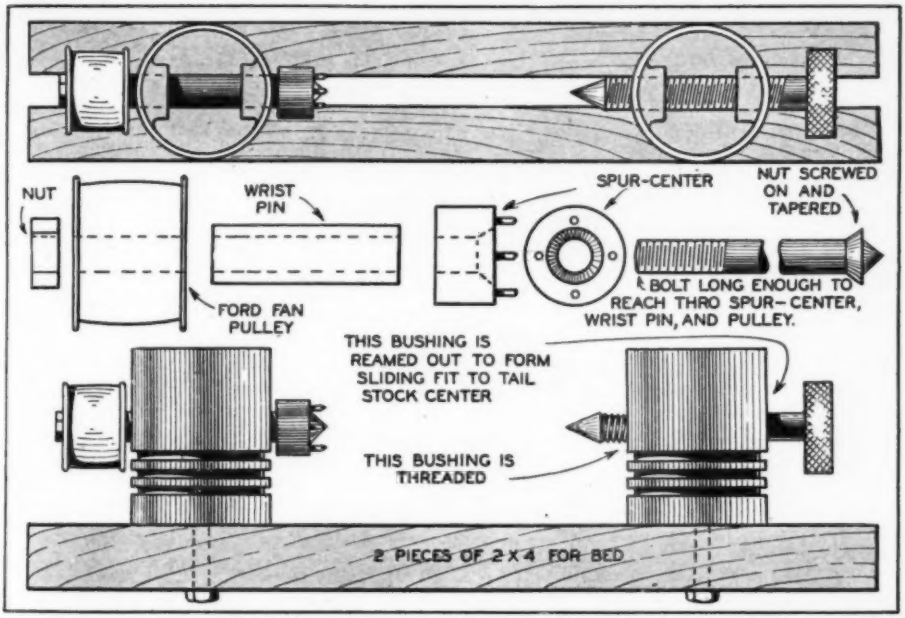




Simple Hanger for Light Pictures

WHERE nail holes in a wall are not desirable, light weight pictures without glass may be hung from a hanger made of a loose leaf note book page reinforcement and a small piece of wire as shown. The reinforcement is pasted on the wall, with the wire beneath it, and the picture hung on the bent wire. In case the picture is rather heavy, two or more of the hangers may be used.—Edwin Emmons.

Lathe Made From Old Piston


NUT
WRIST PIN
SPUR-CENTER
NUT SCREWED ON AND TAPERED
FORD FAN PULLEY
BOLT LONG ENOUGH TO REACH THRO SPUR-CENTER, WRIST PIN, AND PULLEY.
THIS BUSHING IS REAMED OUT TO FORM SLIDING FIT TO TAIL STOCK CENTER
THIS BUSHING IS THREADED
2 PIECES OF 2 X 4 FOR BED

Parts for lathe are assembled and mounted on baseboard as illustrated in this drawing. Tail stock is adjusted by means of the wooden knob on shaft. Spur center, wrist pin and pulley are held by the bolt.

A WOOD turning lathe may be made from two old automobile pistons, procurable in any junk yard for little or nothing, that will run true and turn out good work.

The original wrist pin is used for the spindle, and in order that it may reach through the piston far enough so that the pulley and spur center will run clear when drawn up tight with the bolt, the piston must be ground off slightly on the two opposite sides where the wrist pin bushings are located.

The spur center is made from any piece of metal available, about 1 ½" in diameter and 1" thick. It should have a hole large enough to take the bolt which holds the spur center, wrist pin and pulley together. This hole is reamed out tapering at one end with a large drill. Pieces cut from No. 8 nails may be used for the pins and should be a drive fit into four holes drilled to receive them. After assembling they should be sharpened to a point with a file.

Any pulley may be used but a Ford fan pulley with the projecting hub sawed off with a hack saw serves very well. The bolt which holds these parts together should be threaded at each end and ground to a taper point at one end. A nut is screwed on this end and ground tapering to fit the spur center.

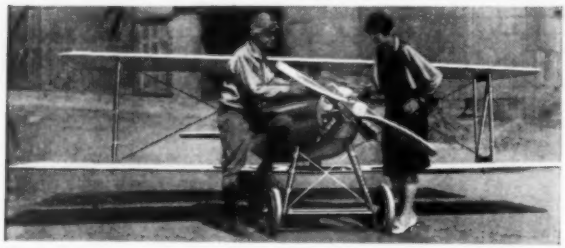
A hole is drilled in the head of each piston to attach them to the bed, which is made of two pieces of wood 2" x 4" and any desired length. These bed pieces are bolted together at each end with a spacer between to allow the head and tail stock to be adjusted at any desired position.

The other piston is used for the tail stock. A piece of shafting is used for the tail stock center of such size that when threaded it will screw into the front bushing of the piston. The rear bushing is reamed out to make a sliding fit. A wood disk is later turned out and attached to this tail stock center for hand adjustment.

No tool rest is shown but for most small work a block of wood held in the left hand and resting on the lathe bed will form an adequate support for the tool held in the right hand.

In assembling the parts of the head stock spindle the parts should first be drawn up loosely with the nut and then adjusted so that they will run true before the final tightening. —D. L. James.

Amazing Speed From Low Powered Baby Racing Plane



Jack Irwin, the designer and pilot of the newest Meteorplane, is shown above explaining the motor to an interested visitor.

DESPITE its diminutive proportions, the airplane shown at the left is not a toy nor model, but a really practical racing ship. It was built in Sacramento, California, by Jack Irwin, the designer of the well known Meteormotor which has been used for several years on light planes.

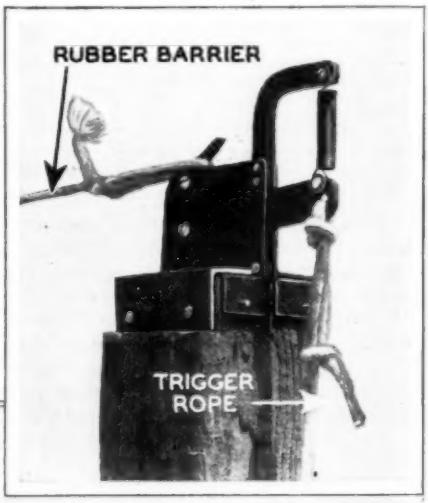
The wing-span of Irwin's latest creation measures only fourteen feet. The plane is powered by the twenty-horsepower four-cylinder air-cooled Meteormotor. This job is without question the fastest plane ever built around a twenty-horsepower engine, having attained a speed of 140 miles an hour over a measured course. Other performance details on this job are not yet available.

Rubber Barrier Starts Trotters

THE invention of a rubber barrier, which when released springs free and snaps across the track, is greatly aiding the starting of sulky races at the various state and county fairs.

The new barrier is placed about one hundred feet back of the starting line, with the starter standing five hundred feet from the barrier. Horses are required to turn 110 feet back of the barrier and walk toward the starter. When all are straight and in their right positions the starter gives the word "go" and there is no recall.

No horses are allowed to pass the barrier until it is snapped, and drivers are no longer allowed to drive around the first turn and take their time coming back, thus delaying the start of the race. The barrier is said to be meeting with unanimous approval in trotting and pacing circles.



Well-known trotters lined up before the rubber starting barrier at the County Fair at Stockton, California. Above is a close-up showing the details of the trigger, which snaps barrier across track.

PLANE TALK

Edited by H. H. ARNOLD

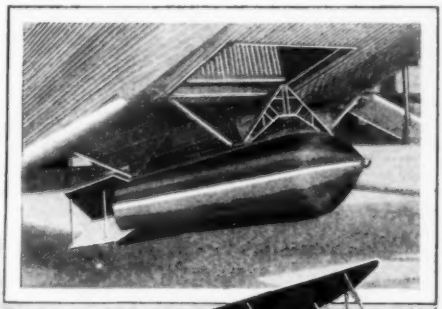
Mechanical Brain Solves Bombing Problems

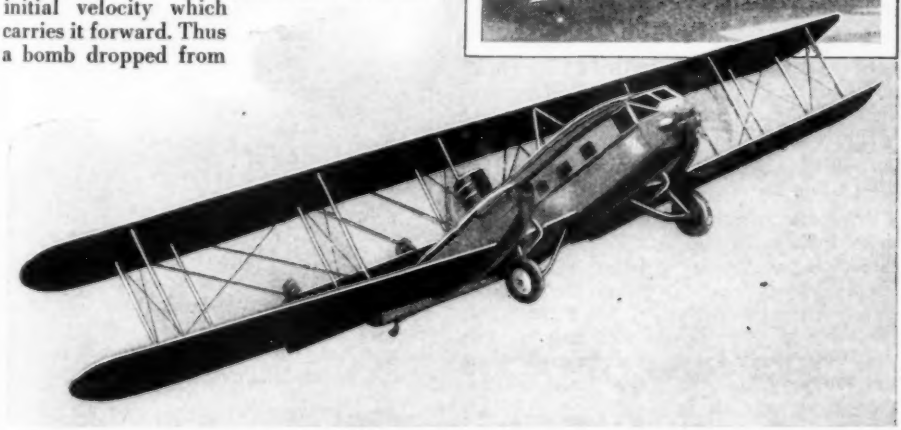
OUR bombers have shown on numerous occasions that they can hit any reasonable target. As they are so sure of this, it is of interest to determine just what makes them so confident of making hits instead of misses regardless of whether the target is moving or standing still. Why do they say that it is just as easy to hit a moving ship as one standing still? These questions may be answered as follows: bombing has become an exact science; bomb sights have become precision instruments; bombing can be done with mathematical exactness.

If a bomb is dropped from a motionless platform and there is no wind it will hit a point directly below. The time of fall of the bomb can be calculated quite readily but varies with missiles of different shapes. If there is a wind blowing, the point of impact will change in accordance with the intensity and direction of the wind, but experience has shown that the time of fall of the bomb will remain practically the same regardless of wind.

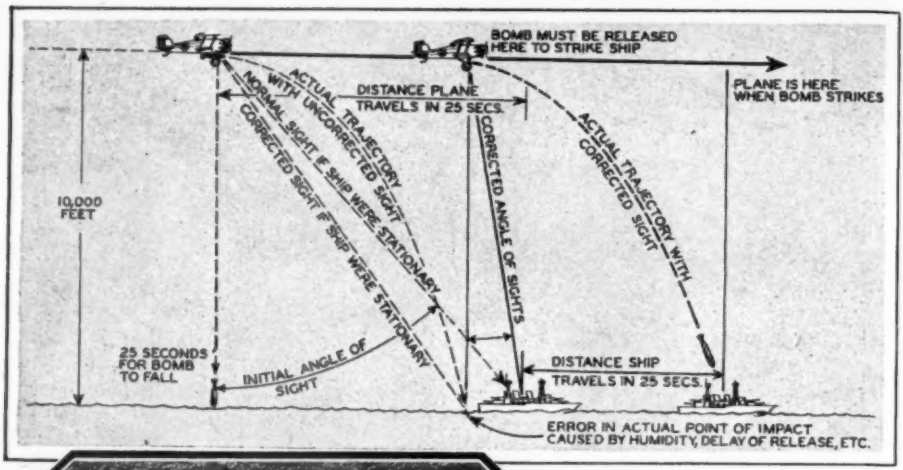
When a bomb is dropped from a moving platform such as an airplane, it receives an initial velocity which carries it forward. Thus a bomb dropped from a moving plane will not fall vertically but will follow a curved path on account of its initial horizontal speed. This curved path or trajectory is quite easily plotted and the angle of the line from plane to point of impact of the bomb can readily be determined. This angle varies with the speed and altitude of the airplane, but is easily computed when these figures are known.

Now if the target is moving in the same direction as the airplane it will move a considerable distance during the 25 seconds required for the bomb to fall the 10,000 feet to the earth. Therefore, if the bomb is released from the original point of sight

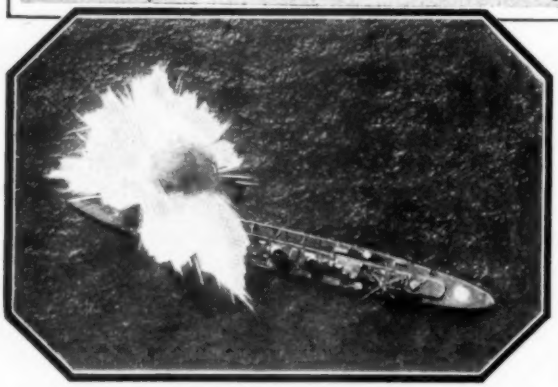




A modern American heavy-duty bombing plane. Above is shown a 2,000-lb. bomb attached to the racks of a bombing plane. Experts hold that two such bombs will do more damage than a 4,000-lb. bomb.


BOMB MUST BE RELEASED HERE TO STRIKE SHIP
PLANE IS HERE WHEN BOMB STRIKES
DISTANCE PLANE TRAVELS IN 25 SECS.
ACTUAL TRAJECTORY WITH UNCORRECTED SIGHT
NORMAL SIGHT IF SHIP WERE STATIONARY
CORRECTED SIGHT IF SHIP WERE STATIONARY
CORRECTED ANGLE OF SIGHT
ACTUAL TRAJECTORY WITH CORRECTED SIGHT
10,000 FEET
25 SECONDS FOR BOMB TO FALL
INITIAL ANGLE OF SIGHT
DISTANCE SHIP TRAVELS IN 25 SECS.
ERROR IN ACTUAL POINT OF IMPACT CAUSED BY HUMIDITY, DELAY OF RELEASE, ETC.

This diagram illustrates the various problems of altitude and speed, and how they are solved by Army bombers. In the case of a plane dropping a bomb on a moving target such as a battleship, the distance that the target moves during the fall of the bomb is taken care of by changing the angle of the movable lens in the bomb sight. Corrections must also be made for wind, moisture and shape of bomb.



A bomb exploding beside an obsolete battleship. With the larger bombs a direct hit is not necessary to sink a ship.

it will hit the water considerably behind the target.

In the same way a strong wind may either make the bomb drop short or fall beyond the target. Suppose the plane is traveling against a 30-mile-an-hour wind. If the wind is ignored a bomb dropped to hit a target will actually hit the earth 725 feet short.

The accompanying photo makes the bomb sight look quite formidable and complicated. In reality its principles are quite simple. The drawing shows the line of travel of light rays through the bomb sight. The telescope is equipped with an eye piece and cross hairs. One prismatic lens is stationary while the other lens rotates around its axis. It is by moving this lens that the angle of fall of the bomb is secured and the bomb sight set properly to insure hitting the target. Note how the prisms divert the light rays so that they will enter the telescope.

There are several variables which must be determined before bombing can be accurately accomplished. They are altitude, which governs the time of fall of the bomb; air speed which affects the path of the bomb through the air; ground speed of the plane which determines the forward motion of the bomb during its fall and the terminal velocity of the bomb which together with the altitude determines absolutely the time of fall.

The air speed is read from the air speed indicator in the cockpit of the plane. The terminal velocity of the bomb used is determined for each type prior to the bombing tests. In calm air the air speed and ground speed of the plane are the same but it is seldom that there is not some wind blowing. Accordingly it is necessary to determine the ground speed of the plane. This is secured as follows:

The bomber picks some point ahead and sets his telescope on it. He knows his altitude, (e.g. 10,000 ft.) and from a reading directly from the bomb sight or from an

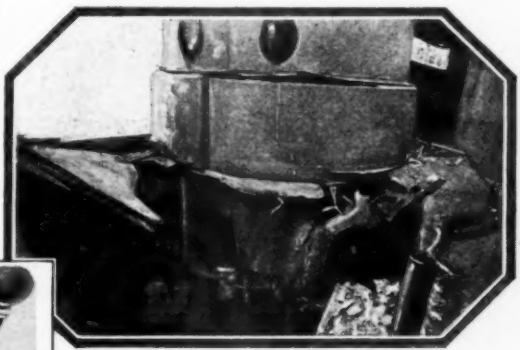
available table secures the information that the bomb will require 25 seconds to reach the earth. Accordingly he moves the prism sufficiently to keep the cross hairs on the target for a period of 25 seconds.

The bomber thus secures the first angle which may be called angle 'a'. He knows that if he sets his bomb sight with this angle and that if conditions are perfect, when the bombs are released when the target again passes the cross hairs (angle 'b'), the bomb will hit the target. This necessitates that the plane be flown at a constant speed, that it maintain its altitude and that it fly in a straight line toward the target until the bombs are dropped.

If the target is moving in the same direction as the plane, angle 'a' is secured in the same manner. But while the plane is moving the target moves also and the angle of sight for release instead of being angle 'b' becomes angle 'c'. A ship moving at a rate of 12 knots will travel about 500 feet in 25 seconds, a distance of about its own length for a large vessel. This may seem like a very small error to correct for but that small difference in position of the target when the bomb strikes is enough to make the bomb miss the target.

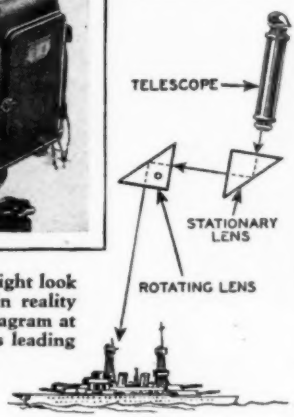
If a plane releases a bomb that follows the trajectory indicated by the curved dotted line on the diagram, it is obvious that the bomb will hit a stationary target. However, if during the time that it takes for the bomb to fall the target moves 500 feet, it is quite obvious that another sight setting must be used to get a hit, a setting which will secure the bomb dropping along the same trajectory. The angle of sight setting for this moving target then becomes 'c'.

There is yet another small correction made for humidity of the air, shape of the bomb and the delay in actually making the release which gives another point of impact.



The above damage was done by a 600-lb. bomb when it landed on the deck of one of our obsolete battleships. Note the cracked gun turret.

This photo makes the modern bomb sight look quite formidable and complicated. In reality its principles are quite simple. The diagram at the right shows the path of light rays leading from the target, through two sets of prismatic lenses, into the telescope of the bomb sight.



Modern bomb sights are so constructed that after the bomber sets the sight for altitude and follows the target with the telescope, the correct bombing angle will be indicated by a blinking light. Thus the operation of the sight is almost automatic. Normally this bombing angle is secured while the plane is some distance from the target. The bomber then sets his sight with this angle and the pilot flies the plane directly toward the target.

Parachutes for AIRPLANE CABINS

THE quest for devices tending to make air travel safer for the traveling public is an old one. It started shortly after Lieut. Tom Selfridge was killed in that first airplane accident at Fort Myer in 1908.

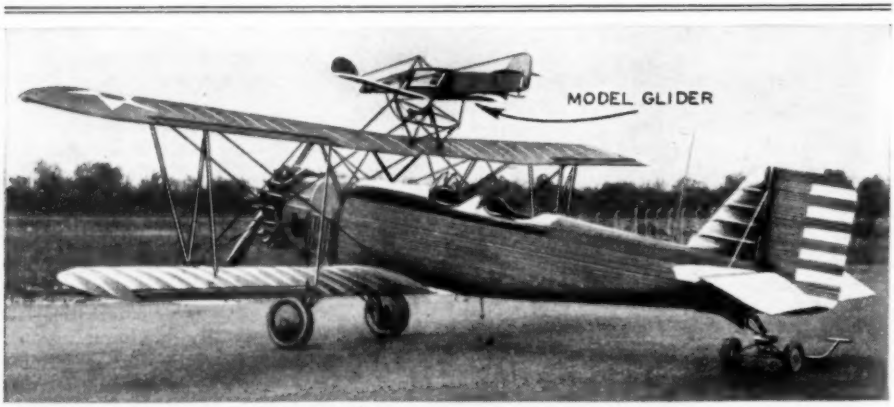
The parachute has been called the aerial life preserver and has justified that name by saving some four hundred odd aviators from death. However there are several reasons why the individual parachute, as we now know it, will not entirely fill the bill for the traveling public. It is too cumbersome for passengers to wear continuously during a trip and too complicated for them to put on in the short time available when an emergency arises.

Passengers can hardly be expected to rise from their seats, walk briskly to the door of the cabin and step off into space. Some of them will be timid, hesitate and block the door, and then it will be too bad for the others. The plane may be in such a position that the passengers will be thrown in a heap at one end of the cabin. In this case it will be almost impossible for any of them to clear the exit and use their chutes. Thus while the individual chute will undoubtedly save many lives in case of emergencies on air lines, there are cases when these chutes would not entirely meet the problem.

Recent experiments indicate that the cabin chute may be the answer to the problem. The cabin chute has many advantages over the individual chute. It can be released by the pilot regardless of the wishes and desires of the passengers. The pilot knows when it is time to leave the plane. There is no possibility of one passenger blocking the way and thus preventing others from leaving the plane. The passengers would never know they had left the plane until they were floating down to earth with the big chute open above them.

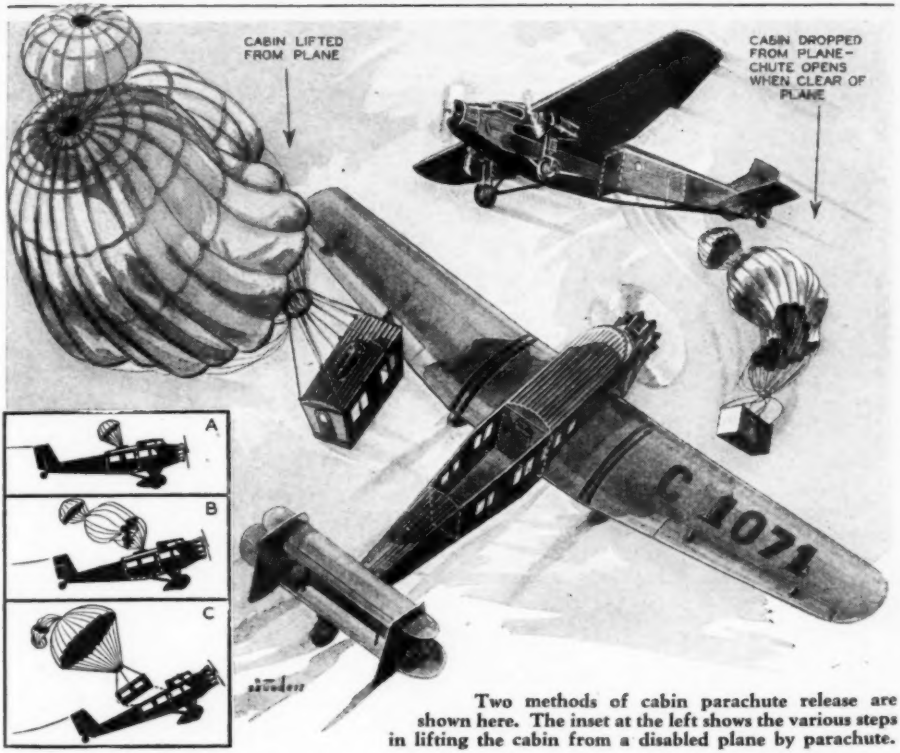
With high wing monoplanes and biplanes the cabin chute could drop from below. However if the plane was on one side, partially or completely on its back, the cabin would probably not drop from the fuselage and the chute would be of no value. The cabin must of necessity be in almost a vertical position or the sides would lock and prevent its release. Unfortunately when it becomes necessary for passengers to bail out the plane is not always right side up. It may be cocked up on one wing, in a dive or on its back. Thus the drop method of release would not be able to meet all conditions.

The drawing shows a different method as applied to a low wing monoplane. In this the pilot pulls a lever and releases a pilot chute. This chute acts as a brake and is attached so as to pull up the nose of the plane. As the nose rises, the pilot chute unfolds the main chute. When the main chute is completely open, it pulls the cabin clear of the plane. As all of these operations require but



Cabin chute experimental plane. The glider on the top wing has a releasable cabin. A time fuse releases the pilot chute after the glider has been flying for a short period. This pilot chute pulls out the main parachute, which in turn lifts the cabin from the glider. A second fuse releases a chute which brings the glider to the ground. This device will be tried out shortly with a full-sized airplane.

Parachute Pulls Nose of Plane Up and Lifts the Cabin Into the Air



Two methods of cabin parachute release are shown here. The inset at the left shows the various steps in lifting the cabin from a disabled plane by parachute.

a few seconds, the pilot still has time to bail out before the plane crashes.

This method of release has an added advantage in that if the plane is on its back, the weight of the cabin will cause it to drop from the fuselage. Thus there is a greater possibility of saving the lives of passengers in this type of attachment than in the drop method.

In the experiments conducted to try out the principle, a small glider was rigged up with a detachable cabin. The glider was taken in the air by a plane and released at an altitude of some 2000 feet. The breaking of contact between the glider and its attachment to the top wing, started a fuse burning. The fuse may be set to burn for any time desired and in the meantime the glider flies along normally.

At the predetermined time the small pilot chute is released. This pulls up the nose of the glider and then launches the main cabin chute which pulls the cabin from the glider. After the cabin is removed the glider again assumes a normal flying angle until the fuse releases a second pilot chute. This slows up the glider until another large chute opens and supports the glider while it settles to the ground. The two chutes used during the tests had the advantage of permitting the cabins and gliders to be used several times as they reached the ground undamaged.

In commercial activities the use of cabin chutes would be many. Collapsible cabins might be used to drop passengers and merchandise from trans-continental planes as they passed over intermediate points. This would give service to many points without necessitating landings being made. The cabins could also be dropped with supplies during floods when people were marooned at points where planes could not land. They might have a use in time of war as a means of dropping ammunition or supplies on isolated detachments. In any event the experiments indicate that the cabin chute may soon be a reality. The next step will be trials with a real plane.

"Mechanized" THEATER

There are no "footlights" in the Earl Carroll Theater —microphones for performance broadcasts take their place. The lighting conductor sits in the console behind the orchestra pit and controls all lighting effects.

A FEW years ago some promoters lured Al Jolson from the footlights, flashed his shadow across the screen and thus blew the lid off former box office records.

Science, mechanics, engineering! Oh! lamented the legitimate actors and showmen—they've got us now. We can't beat that combination. And the wise men sat back and heard the talkies drown the stage voices.

Just as the talkies stole from the theater, so the theater now appropriates ideas from the movies, and bids for public favor with a new attack along the whole theater front.

In Earl Carroll's new $4,500,000 legitimate playhouse, we have an architectural and electrical assault on the prevailing type of movie theater. Situated opposite the mammoth cathedral of the movie, Roxy's Theater, where shadows talk amidst resplendent surroundings, one finds a new citadel of the drama, more electrified, more scientific and more modern than any movie exhibitor has dared to build. Herein the breath-taking spirit of the machine, the metallic language of new materials, the laws of rhythm, suspension, and tension.

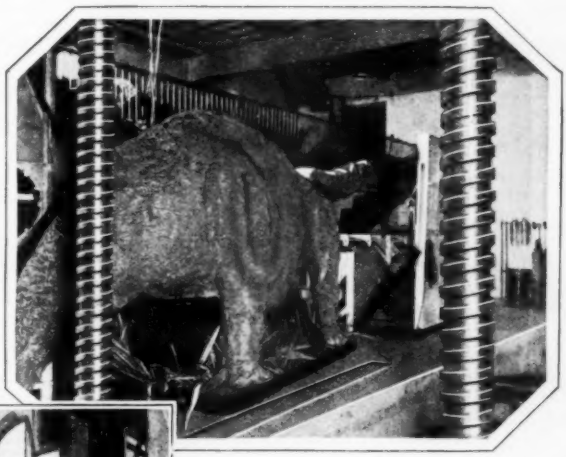
It is the first theater of any size to employ metals in the decorative and architectural schemes, and as such it challenges the skill of movie designers who avoided modern treatments because they knew no precedent to follow.

Joseph J. Babolnay, the architect, achieved

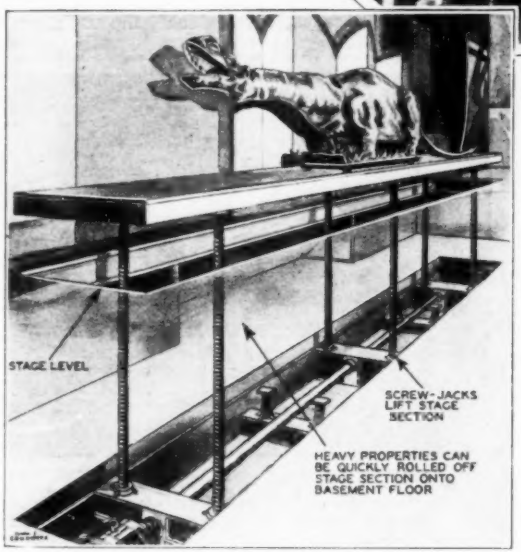
Challenges Movies

by DON GLASSMAN

Taking a hint from the movies, the modern theater is "going mechanical" with a vengeance. In the new Earl Carroll theater all the resources of inventive ingenuity are employed for the comfort of patrons and the production of spectacular stage effects impossible in an ordinary theater.



Scene beneath the stage. Note balcony in background, through which performers can pass from one side of stage to another.


STAGE LEVEL
SCREW-JACKS LIFT STAGE SECTION
HEAVY PROPERTIES CAN BE QUICKLY ROLLED OFF STAGE SECTION ONTO BASEMENT FLOOR

Detail of the stage lifting mechanism. The section can be raised 10 feet above the stage, and when lowered into the basement, heavy properties can be rolled off and new ones raised almost instantly into place, as indicated.

this expression of ultra-modernism out of glass, aluminum, chromium steel, plaster, and velvet.

Although this theater can be turned into daylight, all lighting fixtures are invisible. Artificial light diffuses through the auditorium as evenly as sunshine. One hardly knows from which direction it comes. Were the walls hard or glossy, the illusion of depth would fail to be distinguished; hence, they are covered with bluish-black velvet. To the spectator, the black walls appear to be boundless space, marked off only by the satin-lustered metal forms.

Magnetic controls make it possible to effect a complete "blackout" instantaneously. Heretofore, theater blackouts were ineffective because the reddish glow lingered on the lamp filaments.

One man—the lighting conductor—controls all the illumination. Not one switch may be found backstage. The lighting director, an engineer, commands the stage from a place of importance, directly behind the orchestra leader. He wears a full dress suit. In his hands he holds the reins to every light in the theater. His commands are obeyed instantly and accurately.

In the proscenium arch, illumination comes from cold-cathode neon tubes, with a special dimming control. Heretofore it has never been possible to dim such lights. In all there are 50 incandescent lighting circuits, 34 on the stage and 16 in the house, in addition to the large number of arc cir-

Grand lounge room of the Carroll Theater, done in modernistic style. Chromium plated metal is used in the wall designs.

cuits. The auditorium lights have four colors—red, blue, green and white—the most elaborate combination in any theater.

All the lights have a value of 367,000 watts, of which 231,000 are on the stage and 136,000 in the house proper. The stage arc lighting circuits must be added to this. Notwithstanding this stupendous amount of current, the control system requires a maximum of only 200 watts. The control board does not handle large currents directly, but through the medium of electron tubes and a reactor system.

The lighting director, and at times, the stage manager, occupy a small cabin, 6 by 4 feet, from which the manager may telephone directions to all parts of the theater.

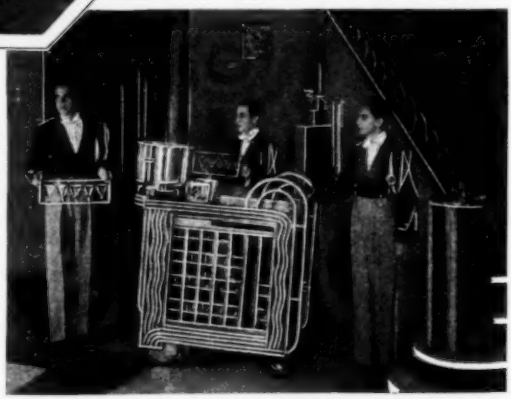
The lighting director may turn any one of 50 knobs, connected to as many circuits. By the use of master switches, he controls all the circuits with one motion of the hand, or he can split the control into major and minor divisions, depending upon color, location and function.

Performers in this theater may dance to the very edge of the stage—there are no footlights. Conventional lighting arrangements are taboo. In front of the balcony facia, fourteen 2,000-watt lamps throw illumination on the stage. Directly above the balcony, in the theater arc, are eight powerful lamps.

The decorative lighting is reflected from the polished metal panels and from channels carved in the ceiling.

Behind each seat the spectator finds a program lighter. By pressing a button, he lights a candle-power bulb and reads his program without disturbing other patrons.

Backstage of the Earl Carroll Theater one finds many conventional practices reversed. At the very entrance, for instance, the usual gruff-spoken doorman is absent, and in his place are handsome and jaunty young women.



Five mechanically refrigerated water wagons like this are used for distributing drinks among spectators. Metal square in center background wall is loud speaker in foyer broadcasting stage program, used also for announcements.

If you bring flowers to your favorite actress, the door women see that they are stored in a refrigerator, and handed to the proper person after the performance, in perfect condition.

The dressing rooms have individual tables, chromium plated and with black glass tops. Performers have private telephones from which they may communicate with anybody in the house, or call outside.

Lighting Director Controls All Lights From Console in Front of Stage

Soft-voiced loud speakers in each dressing room make it possible for the performers to know exactly what takes place on the stage.

The call boy, another fixture of the stage, passes. Actors in this theater are paged by a system of loud speakers.

The old system of intermission bells prevalent in legitimate theaters, gives way here to another loud speaker. From behind the stage one hears the stage manager's voice in the lobby saying: "Ladies and gentlemen, I am just sending the orchestra into the pit; the curtain rises in two minutes."

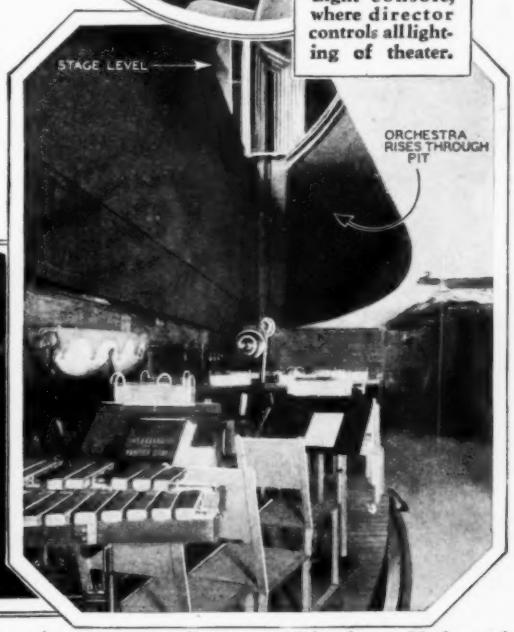
A powder spraying machine saves time and labor for actors who need "makeup". One merely turns a switch and the apparatus sprays any desired part of the body.

The stage itself is enormous, even for a 3,000-seat theater. It measures 100 feet from the floor to the gridiron, 100 feet from wall to wall; the proscenium opening is 46 feet. The 150 drops are lowered by the latest counterweight apparatus. Motors are located in the rigging loft.

Below the stage proper is a vast trap room, 40 by 100 feet, and 19 feet deep. Two lifts rise from the trap room floor, the orchestra lift and the stage lift, which can rise fully ten feet above the stage floor. The floor of the lift can be rolled on and off, so that it is possible to build one set while the other is being played on the stage. Between acts, the lift descends into the trap room; the old set is rolled off, and the new one rolled on. Thus the complete change of scenery requires little more than one minute.

Any known mechanical equipment can be installed on this stage, from the underwater ballet, to a spring-board for elephants and an ice-skating rink for dancers.

Light console, where director controls all lighting of theater.



Left above—individual lights on rear of seats make program reading easy. Right above—Underneath view of orchestra pit, showing instruments on platform ready to be raised through opening to stage level.

Aquaplane Towed by Auto Outrigger in New Water Sport

In new California water sport, aquaplane is towed by means of outrigger attached by a swivel to the rear of an automobile. The pole is braced by a rope from the spare tire and from the radiator cap.

Stilts Make Wall Cleaning Easy

STRAPPED to the feet, these simple stilts are time and labor savers for wall paper cleaning and wall washing jobs. An old pair of shoes may be nailed to the tops instead of using straps, if it is desired. Three-quarter inch wood is used, 7 ¾ inches wide and from 15 to 20 inches high according to height of ceiling in your home.

Strapped to feet as shown above, these stilts take place of ladder, making wall paper cleaning easy.

WATER enthusiasts are now able to skip along Pacific waves without actually going to sea. A 20-foot pole attached by a swivel to the rear end of an automoible does the trick. The aquaplane rider skims over water two feet deep as the car speeds 20 miles along the beach. The pole is fastened by a bolt attached to a rear bumper and can be swung over when the car is turned around.

One brace rope swung from the top of the spare tire or the handle of the door fitting over the rumble seat holds the pole horizontal while a forward brace rope, swinging back from the radiator cap, holds the pole against the backward pull. The weight of the entire additional equipment, including pole and rope, is only 34 pounds.

Railways Aid Health of America

HOW railways and refrigeration have changed the food habits of America, is explained by Mr. Ralph Budd, President of the Great Northern Railway Company. One example is lettuce. Nowadays lettuce may be saving millions of Americans from illness due to lack of the important vitamines which such green plants contain. Refrigerated freight lines have been responsible for this. Application of these same benefits of modern railway transportation to other food materials has had the result in the past few years, Mr. Budd states, of giving the average American diet more variety than formerly, especially in the way of fresh fruits and vegetables which science now regards as essential to good health.

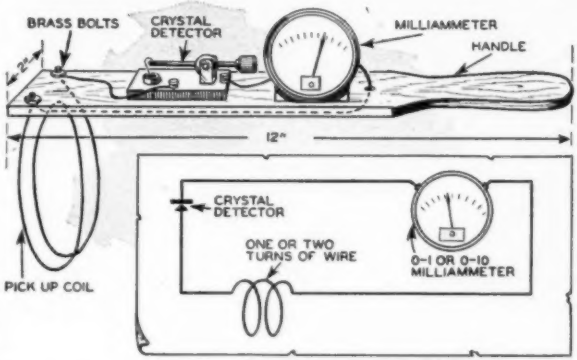
SPARKS from the RADIO EDITOR

Edited by L. B. ROBBINS

Sensitive R. F. Pickup Device for Testing

THE usual method of tracing out R.F. currents in transmitting circuits or neutralizing buffer stages and power amplifiers is by means of a neon lamp or flashlight bulb in series with a loop of wire held near the inductance. A much more sensitive device can be easily built from odds and ends as shown herein.

It consists of a suitable base or handle upon which are mounted a low reading milliammeter, a crystal detector and the pickup loop. By holding the loop near the inductance in the usual manner, even the slightest indication is discerned in the meter that would not light the bulb used in the former method. A meter reading from 0 to 1.5 mills is the best to use but one reading up to 10 mills will fill the bill.



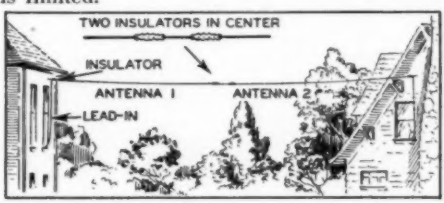
Milliammeter, crystal detector and exploring loop are mounted on the wooden handle as shown. Insert gives wiring diagram.

Fashion a stick to the dimensions given in the drawings. Then make a double turn coil of stiff copper or brass wire about 3 inches in diameter and with the turns a half inch or so apart. Push the end up through holes in the square end of the stick and solder or otherwise fasten to two bolts as shown so the coil hangs vertically below the stick. Now mount a crystal detector on top of the stick and back of it place the milliammeter. Connect all parts in series as illustrated in the wiring diagram.

To trace out R. F. currents adjust the crystal detector to a sensitive spot and then hold the coil an inch or two away from the inductance to be tested. As R.F. is picked up the meter needle will rise, depending upon the sensitivity of the meter. When no R. F. flows, the needle stays put.

Insulators at Center of Wire Make One Antenna Do the Work of Two

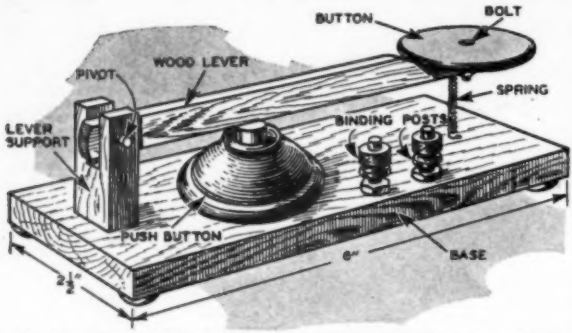
HERE is an old stunt for use where two neighbors wish to erect receiving aerials but the space between the two houses is limited.



Two antennas are strung in space of one by placing insulators in center as illustrated above.

The space is measured between the spots for anchoring the lead-in ends of the aerials on each house. Then each aerial is cut slightly less in length than half this distance. Connect two insulators in series and fasten the end of an aerial to each end insulator. Then fasten an insulator to the other ends of the aerials and tie these in place on each house. Attach the lead-ins at these ends and connect to the receivers. With a spiral spring at one end the double aerial can be stretched tight and thus both parties can secure perfect reception, each from his half of what would otherwise be a single aerial.

Efficient Sending Key Made From Door Bell Pushbutton



Pushbutton and key lever are mounted on baseboard as shown.

AN ORDINARY pushbutton, mounted on a baseboard and keyed as shown in the accompanying drawing, will make about as good a transmitting key as you could possibly want. At one end of the baseboard mount an upright, with a fork cut in one end. Then cut out a wood lever about ⅝ in. square and six inches long and insert the end in the upright fork, hinging it with a pinion. On the other end of the lever bolt a button to serve as a knob.

Next place a pushbutton on the base so the knob comes directly under the lever when the latter bears down on it. A spiral spring holds the lever in normal position as illustrated. Leads from the pushbutton are wired to the binding posts. Pressing down on the lever closes the pushbutton contacts to make the dots and dashes.

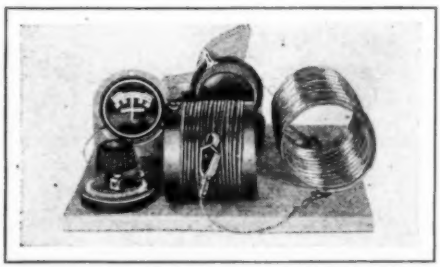
Testing Transmitters With This Dummy Antenna Prevents Interference

THE transmitting amateur can make good use of a dummy antenna for testing purposes. It really should be used at all times when not actually on the air as it will greatly reduce interference to others and give just as satisfactory results for trying out different adjustments of the transmitter or new outfits and parts.

The accompanying photograph and diagram show how to assemble a simple apparatus to accomplish this. Use any suitable baseboard 8 to 10 inches square. At one side mount the antenna coupling coil made of 8 to 12 turns fairly heavy wire. Then at right angles mount a second coil of any reasonable number of turns of smaller wire tapped every few turns as indicated. The rheostat should be of from 25 to 30 ohms resistance. Then at the rear of the baseboard mount a .00025 or .0005 variable condenser and an antenna radiation meter, or, failing the latter, a flashlight bulb or an old 199 type tube and socket. Connect the parts as illustrated in the diagram.

To use this dummy proceed as follows. Provide a support for the outfit so the coupling coil will be a few inches from the primary coil of the transmitter exactly as any antenna coupling coil would be placed. Start the transmitter and close the key circuit. Now by means of the tapped coil, varying the rheostat resistance and the capacity of the condenser, obtain a reading in the antenna indicator that will approximate that of the regular antenna when in use. Mark the positions of the various parts and that's all there is to it.

Whenever the transmitter is to be tested simply remove the regular coupling coil, substitute the dummy antenna instead and you can make all your trials and adjustments without causing overdue crowding of the air and interference with transmissions by other amateurs.



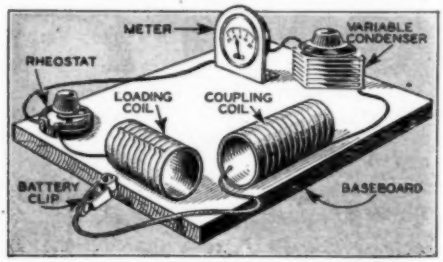
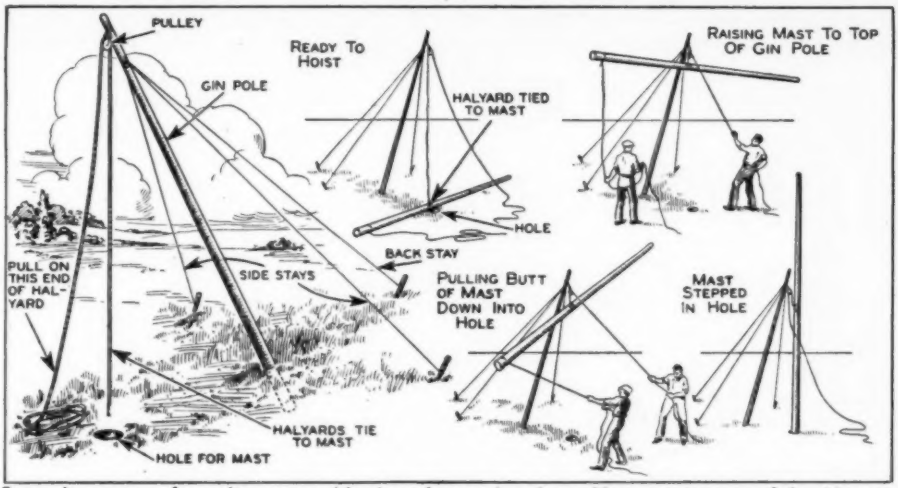


Photo shows completed "dummy" antenna. Drawing illustrates arrangement and wiring of parts.

Erecting High Masts Is Simple, Easy Job With Gin Pole



Stages in process of erecting masts with gin pole are given here. Note arrangement of the side stays.

ERECTING an extra high mast is no little job but it can be made comparatively easy by the use of the "gin pole". Let's suppose, for instance, that you have a 50 or 60 foot stick to raise. First tie a strong rope around the balancing point and tie a second rope around the foot. Then dig the hole for the foot and rig the block and halyards and necessary stays at the tip so it will be fully rigged when raised.

The gin pole consists of a strong pole somewhat longer than the distance from the foot to the balancing rope. Fasten three very strong stays at the top and pulley block, and then dig a hole for the foot of it about 4 to 5 feet back from the mast hole. Stay the gin pole directly to the rear and fasten each side stay almost on a line with the mast hole and somewhat in front of the foot of the gin pole.

Stand a man at the foot rope, and then raise the mast to the top of the gin pole. Then have the man at the foot rope slowly pull the foot of the mast down until it rests over the hole. Then the weight of the mast can be easily released until the foot enters the hole. The mast can then be stayed and the hole filled in, after which the gin pole can be taken down and the job finished up.

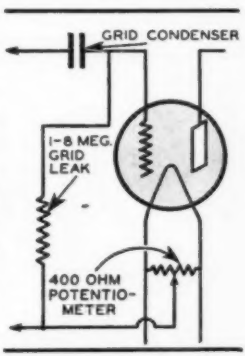
The process of erection can be easily followed by the accompanying sketches and no trouble should be experienced in thus erecting masts of good length and too cumbersome to set in the ordinary manner.

Smoothing Regeneration in Home-Built Receiver

THE usual home built receiver, both for short wave or broadcast frequencies, has the grid leak shunted across the grid condenser. Often it is found that regeneration is not smooth. It plops in or out and causes more or less trouble when pulling in the weaker stations. A better method will be found as shown in the diagram.

Remove the leak from the mounting and use a separate mounting placed to reach across from the grid post on the socket to beyond the filament socket terminals. Now connect the ends of a 400 ohm potentiometer across the filament terminals and lead a wire from the potentiometer arm to the detector tuning coil and condenser. Connect the remaining end of the grid leak mounting to this wire and there you are.

Use any quiet leak from 1 to 8 megs and then set the potentiometer arm for smoothest operation. Regeneration will be found much more easily controlled than by the old method.



Grid leak and resistor are wired up as shown here.

Brighten Your Christmas

Fig. 1. You can put vivid color in your tree by spraying the limbs with varnish, then sprinkling on flake mica as demonstrated. Highlights from mica make tree glow attractively.

by **Thornton Hallet and Dick Cole**

With a few extra inexpensive materials you can decorate your Christmas tree so that it will attract wide attention by its artistic lighting effects. Ideas for making novel little light ornaments that will heighten the festive air of Christmas are given in this article.

CHRISTMAS soon will be with us again! With its approach come thoughts of resurrecting from the trunk in the storeroom, the glistening, fragile ornaments; yards and yards of silvery tinsel; strings of tiny, colored electric lights, which add the finishing touch to the Christmas tree decorations.

Sometimes it is difficult to obtain a perfectly symmetrical tree the size one requires. However, any tree can be built up into a symmetrical cone shape. To do this, some extra branches are necessary. These can be obtained from a cheap misshaped tree.

First the scraggy branch is cut off flush with the tree trunk. Then one of the extra branches is cut to suitable length, and the bark is peeled off the end for about one inch, as illustrated in Fig. 2. A hole the size of the peeled branch is bored in the tree trunk where the scraggy branch was removed, and the new branch is inserted so that it fills in naturally. It should fit tightly, but glue is not necessary.

After the tree has been shaped, the next operation is to set it up. The setting up method shown in Fig. 2 will be found very satisfactory. It serves a three-fold purpose: as a support for the tree; as a shelf for the

TREE With Electricity

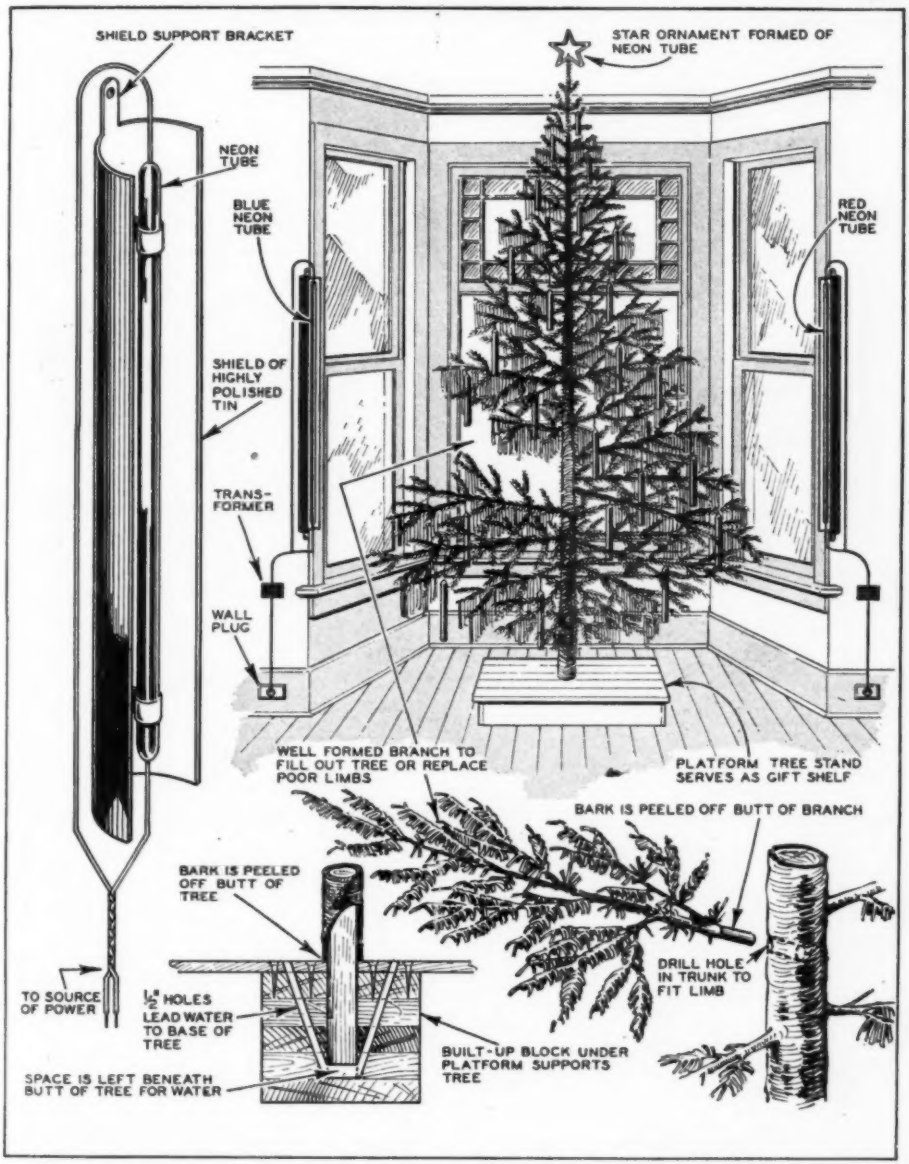
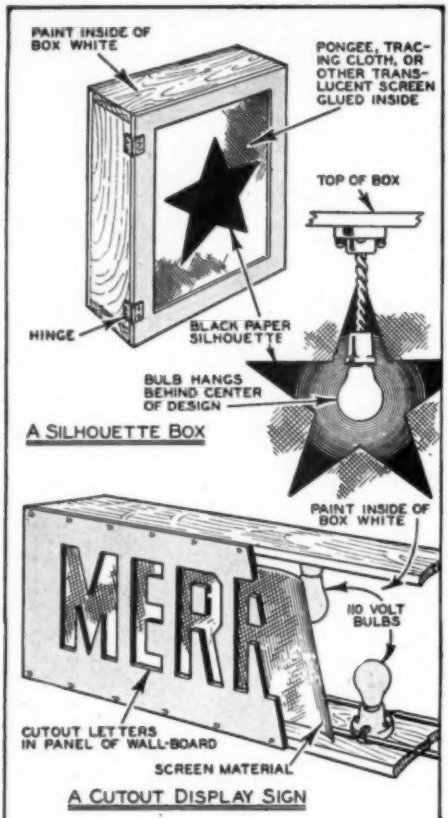

SHIELD SUPPORT BRACKET
STAR ORNAMENT FORMED OF NEON TUBE
NEON TUBE
BLUE NEON TUBE
RED NEON TUBE
SHIELD OF HIGHLY POLISHED TIN
TRANS-FORMER
WALL PLUG
WELL FORMED BRANCH TO FILL OUT TREE OR REPLACE POOR LIMBS
PLATFORM TREE STAND SERVES AS GIFT SHELF
BARK IS PEELED OFF BUTT OF BRANCH
BARK IS PEELED OFF BUTT OF TREE
DRILL HOLE IN TRUNK TO FIT LIMB
TO SOURCE OF POWER
½" HOLES LEAD WATER TO BASE OF TREE
BUILT-UP BLOCK UNDER PLATFORM SUPPORTS TREE
SPACE IS LEFT BENEATH BUTT OF TREE FOR WATER

Fig. 2. Lights from varicolored neon tubes playing on trees create highly artistic color effects, eliminating customary strings of lamps. Drawings above show best arrangement of reflector shields. To keep tree green and fragrant set the base in special block shown at bottom. Symmetrical, cone-shaped tree can be formed by removing shaggy branches and replacing them with more shapely ones, as shown. Extra branches for this job can be obtained from cheap misshapen tree.



more attractive display of presents; as a means of irrigating the tree to keep it fresh and fragrant.

First a simple platform four feet square and ten inches high is made of any cheap lumber. On the under side of this platform, at the center, is nailed a built-up block of any soft wood. A hole is bored through the platform and nine inches into the block to receive the butt of the tree. The bark should be peeled off so that the tree rests upon the bark and the base does not "bottom" in the hole. Water is supplied to the pocket thus formed through half-inch oblique holes. It will be found quite amazing the amount of water the tree will suck up.

The tree is set up! Now for the lighting and decorating. But why have strings of lights on the tree at all? Neon tubes placed on each side of the tree and a little in front of it, create a strikingly beautiful effect, bathing the tree in a soft, mellow glow. The tubes are held in semi-circular shields so that all their light is diffused on the tree. This is illustrated in Fig. 2.

It is best to use a red and blue neon tube. From different positions the colors red, violet, or blue predominate. The passer-by will be entranced by the glamorous color changes. Straight neon tubes are not expensive. They can be bought from any neon sign company. The simple tin shield can be made by any tin-smith. The total

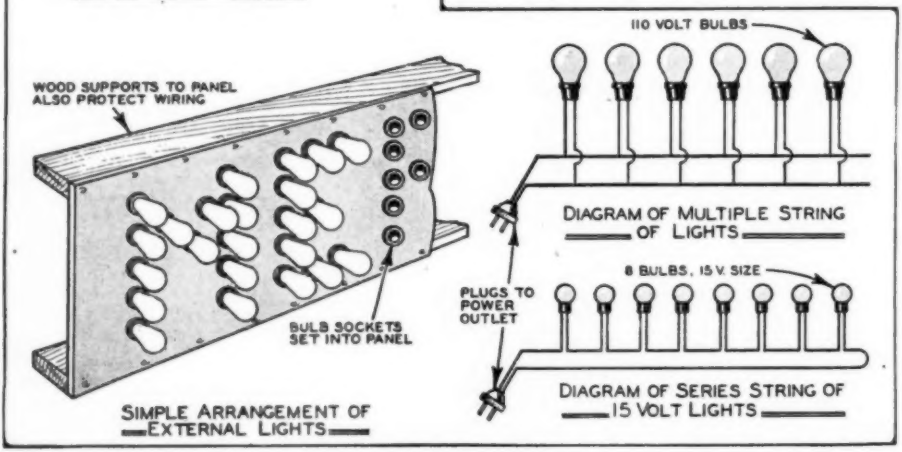

WOOD SUPPORTS TO PANEL ALSO PROTECT WIRING
BULB SOCKETS SET INTO PANEL
SIMPLE ARRANGEMENT OF EXTERNAL LIGHTS
110 VOLT BULBS
DIAGRAM OF MULTIPLE STRING OF LIGHTS
8 BULBS, 15 V. SIZE
PLUGS TO POWER OUTLET
DIAGRAM OF SERIES STRING OF 15 VOLT LIGHTS

Fig. 3. A distinctive novelty in Christmas decorations is the silhouette box, shown above, made by attaching cut-out star or other figure to front of lighted box. Cut-out display sign, lighted by bulbs inside, also attracts wide attention. At lower right are two favorite lighting circuits, suitable for trees. In series hookup, all lights on string are extinguished when one goes bad.

cost of this indirect lighting system is scarcely more than the cost of several strings of "parallel-wired" Christmas tree lights. And the lighting effects are not comparable.

Of course, the neon light thrown on a bare tree would not be very spectacular. The ornaments on the tree must reflect the light and the color. A way to bring up vivid color is to spray the tree with thin varnish. An ordinary fly sprayer can be used for this purpose. Then sprinkle flake mica over the tree as demonstrated in Fig. 1. At Christmas time, "imitation snow", which is really flake mica, can be bought at any store selling Christmas tree decorations. The high-lights reflected from the mica flakes will set the tree aglow with vivid light.

As for electric lights, practically every one who has electricity in the home has used the little miniature lamps in strings for decorating the Christmas tree and the table. But how many realize the many other useful ways to utilize them? Their uses are legion and the few hints herein given may open up an extensive field for using such lights for other seasons of the year.

Let's suppose, for instance, that you want to light up one or more yard-grown trees or some placed there for Christmas purposes. You can string the colored lamps about the limbs and twigs with as many

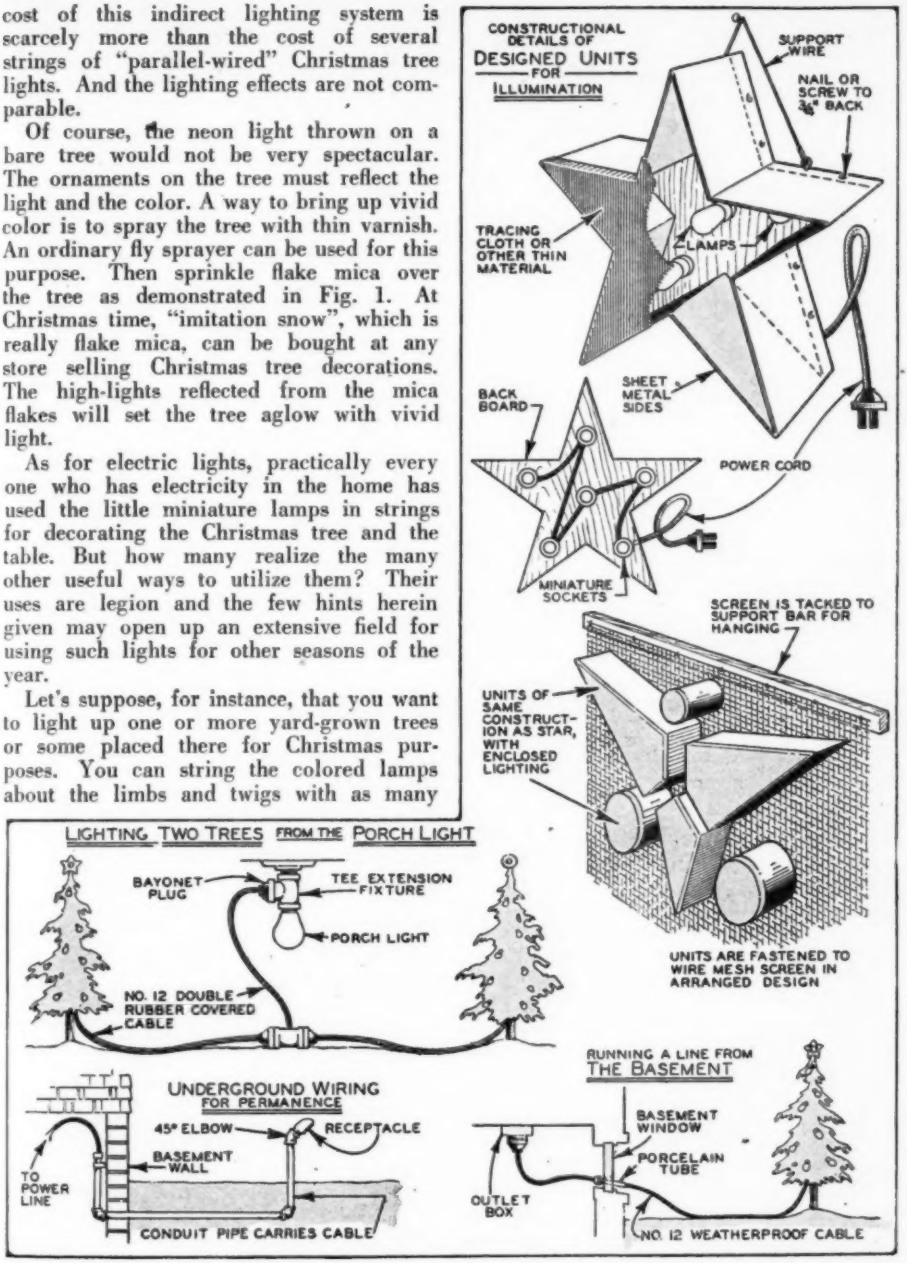


Fig. 4. Christmas star, made by tacking strip of zinc around star-shaped baseboard and covering with tracing cloth, is distinctive ornament. Applique designs supported by screen hung from window headers parapet give novelty to Christmas displays. Below are three methods of running current to trees, set up or grown on the lawn. In all cases use weatherproof cable.

Cellophane Cylinders, "Icicles," Make Tree Glow With Vivid Highlights

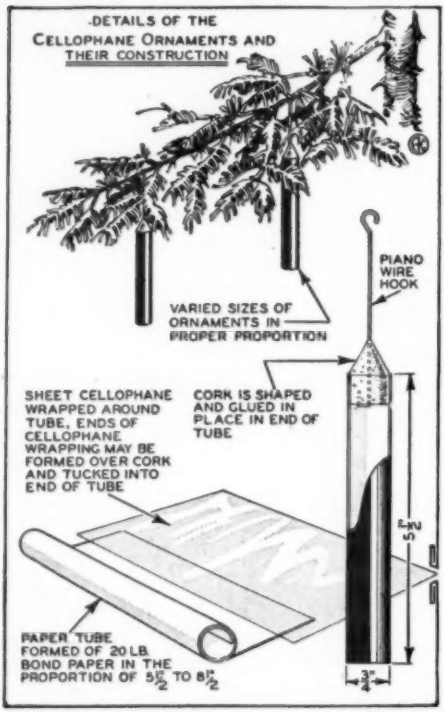

DETAILS OF THE
CELLOPHANE ORNAMENTS AND
THEIR CONSTRUCTION
PIANO WIRE HOOK
VARIED SIZES OF ORNAMENTS IN PROPER PROPORTION
SHEET CELLOPHANE WRAPPED AROUND TUBE, ENDS OF CELLOPHANE WRAPPING MAY BE FORMED OVER CORK AND TUCKED INTO END OF TUBE
CORK IS SHAPED AND GLUED IN PLACE IN END OF TUBE
5 1/2"
PAPER TUBE FORMED OF 20 LB. BOND PAPER IN THE PROPORTION OF 5 1/2 TO 8 1/2
3/4"

Fig. 5. Something new in ornaments is this cellophane cylinder. Bond paper is rolled into cylinder as shown, covered with sheet of cellophane, and hung from tree with piano wire hook through cork.

clusters as desirable and plug one into the other until you are ready to lead to the source of electricity. Use, of course, rubber-covered cable and weatherproof sockets and strings made for the purpose. Lay the cables on the ground and plug each one into a weatherproof double extension plug, as illustrated in Fig. 4. The porch light will usually be the most logical place to draw power from.

But if you have no outside light then the best way to plug in will perhaps be through the cellar window (Fig. 4). In this case run the rubber-covered cable as before, but through a porcelain tube inserted through one side of the window frame. Then plug the bayonet into any convenient socket in the basement.

A third way to obviate all this temporary wiring each winter is to have your electrician run some underground conduit pipe from one side of the meter through the basement wall and under the lawn to terminate at convenient points about the yard in upright outlets as shown in Fig. 4. These should project high enough above the lawn to clear any ordinary falls of snow and the receptacle should be face downward at an angle to shed moisture.

Now let's consider building some electrically-lighted outdoor and indoor fixtures that will prove distinct novelties. The star is, of course, the symbol of Christmas. A nice illuminated star can be easily built as shown in Fig. 4. Cut out a star from strong wood, making it about 18 inches wide. Now around the edge tack a sheet of sheet metal such as zinc about 4 inches wide. At equidistant points about the inside face of the star fit sockets to take the seven or eight bulb string of lamps and run the cord out through a hole in the back. Then the front of the metal can be covered with tracing cloth, colored gauze or other translucent material. Figures can later be painted on this front or it can be left plain. A coat of spar varnish will make it weatherproof.

Applique designs such as shown in Fig. 4 are interesting and can be suspended from

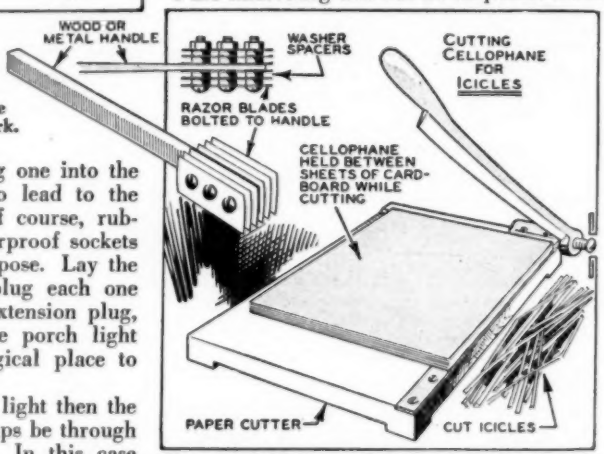
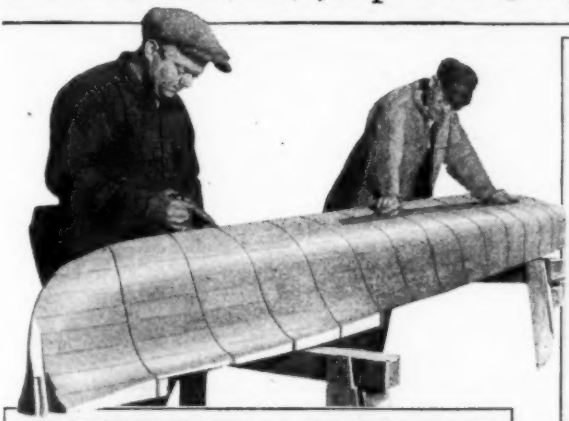


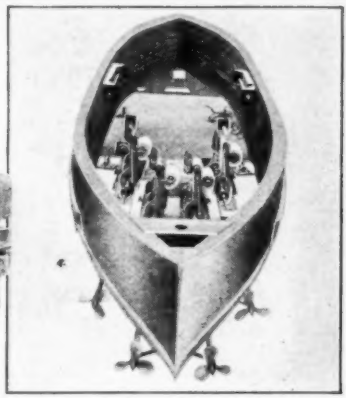
Fig. 6. "Icicles" to enhance tree appearance are made by cutting aluminum foil in strips with paper cutter or the special razor blade device shown here.

the window headers parapet of the house with beautiful effects. Construct lighted units similar to the star and fasten these to sheets of heavy galvanized wire mesh. Metal

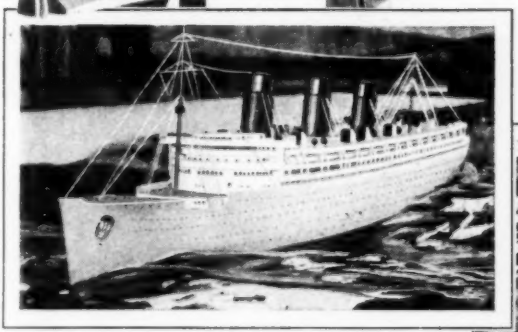
(Continued on page 184)

Model Tests Improve Ship Hull Design

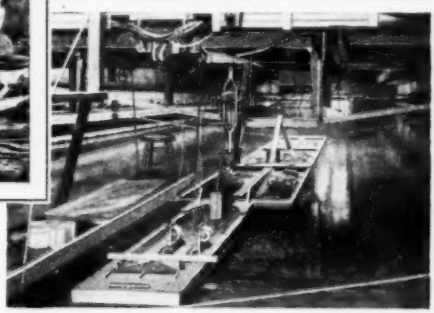




Model hull equipped with small electric motors and propellers to operate under its own power in testing water resistance.



18-foot model of Cunard liner undergoing tests in tank where manufactured gale is in process. Top photo shows model makers at work on hull.



In this photo are seen two model barges being tested in Washington Navy Yard indoor pool. Recording machines are carried on towing carriage.

AS YOU watch the mammoth battleships of Uncle Sam's navy, or the great liners of the merchant fleet, steam out to sea did you ever ponder over the scientific puzzle of how the shapes of their hulls are determined or how they are provided with efficient power plants?

What makes possible the super efficiency of these huge ships is the technical "play" of nautical engineers with model ships at a large indoor testing pool at the Washington, D. C. Navy Yard. Our mastodonic warships as well as the greatest ocean greyhounds are figuratively hatched from these miniature models.

Constructed by expert craftsmen from seasoned California redwood, the models are tested in a great tank 470 feet long, 42 feet wide, and 14 feet deep, and holding 1,000,000 gallons of water. Such marine exigencies as a stormy sea can be imitated in the test by an electrical agitator in the pool.

An electrified towing carriage which runs on rails mounted along the sides of the test basin is used as motive power for hauling the ship models up and down the pool. Automatic recorders keep tab on the speed of the model ship and determine the resistance that develops to its passage through the water.

Marked improvements have been made in hull design as a result of these model basin tests. Models for 2,800 proposed ships have been tested out prior to construction to determine power requirements, saving the marine industry many millions of dollars.

Hinged Fins Strapped to Legs Aid in Treading Water

Albert E. Arnold, noted swimming coach, preparing to test flipper-like walking shoes with hinged discs that spread out as user treads water.

ABOUT the strangest thing yet in the way of contraptions for walking on water recently appeared in Catalina Island, California. Consisting of a set of three flipper-like discs attached to the lower leg, the device gets its water treading power from the mechanical arrangement whereby the flippers spread out on the down stroke to catch hold of the water, and fold up out of the way as the leg comes upward. The results of the test, conducted by Albert E. Arnold, noted swimming coach, is indicated in his remark, "I'll still use boats for a while."

Keeping Bugs Off Fresh Paint

PAINTING is often spoiled by the numerous bugs that are attracted to, and trapped in, the fresh paint. Adding a little oil of wintergreen prevents this.

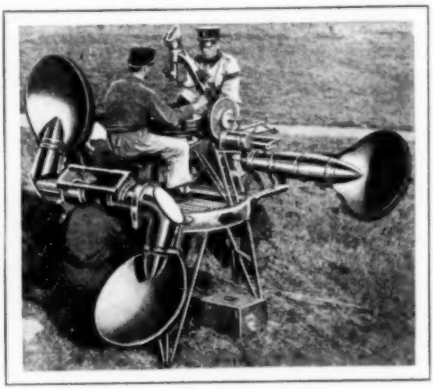
Gloves Dry Quickly on Wire Frame

A PRACTICAL glove drier that stretches the gloves taut so that they do not shrink after washing is now being marketed by manufacturers. This drier, shown below, consists simply of a frame made from strong wire and shaped to fit any glove.

Gloves are dried quickly and without shrinking on frames made of stiff wire, as shown above.

Plane Detector Like Giant Spoon

WHEN Stockholm, Sweden, was recently "bombarded" from the air in a sham attack, a new and strange type of sound detector was used to pick up the planes. Three giant spoon-like ears caught the sounds in their concave surfaces, rendering the device sensitive to motor hums at a surprising distance.



The new sound detector apparatus which was used during recent army maneuvers in which Stockholm, Sweden, was "bombarded" from the air.

How Garage Gas Kills the Brain

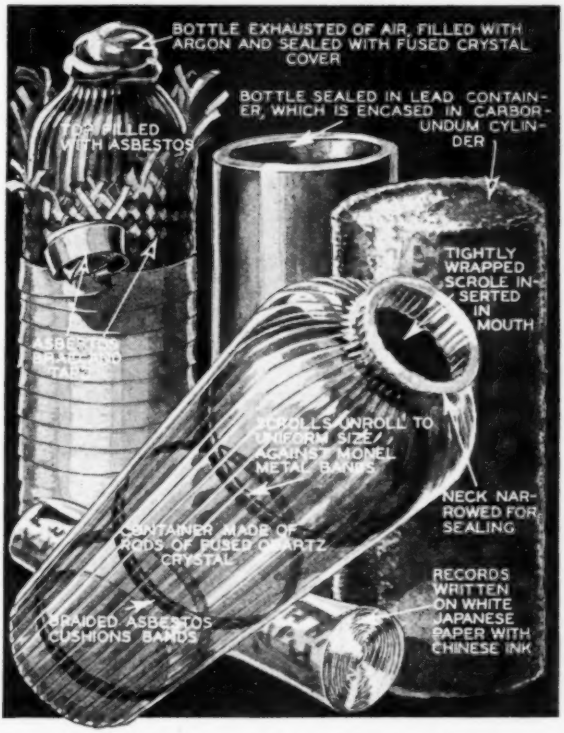
THE United States Health Service shows why monoxide gas victims lose consciousness and die without warning. A microscopic examination of brains of dogs that had breathed the poisoned air, revealed that some of the nerve cells were almost completely destroyed. Some had burst and were partly liquefied and others were shrunken and distorted. Blood vessels were swollen and clogged with stagnant red corpuscles, most vital parts suffering most.

Indestructible Container to Keep Records 10,000 Years

PEOPLE living 10,000 years hence will have an opportunity to know what manner of people we of this age are through a scheme devised recently by a Japanese scientist which makes use of a special indestructible container that will preserve records intact against the ravages of milleniums.

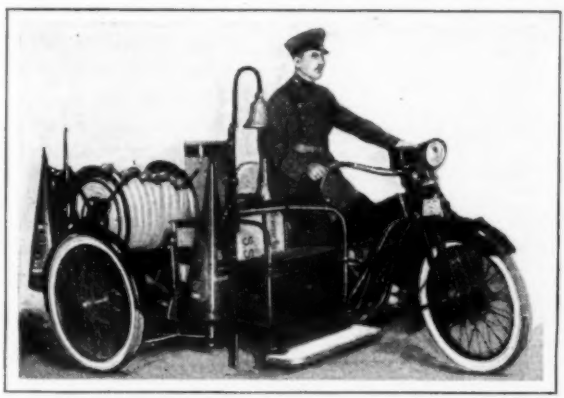
Records describing conditions of the present will be written in Chinese ink on scrolls of dark blue Japanese paper, which is said to be more durable than any other material. Of especial interest in this project is the unique container in which the scrolls will be kept to inform the peoples of far-off centuries what things were like in this era. The inner container consists of a jar made of rods of fused quartz crystal and lined with asbestos-covered bands as illustrated in the accompanying drawing.

Bound with asbestos braid and tape, this jar will be exhausted of air, sealed at the top and then placed in an intermediate lead container. Finally the lead container will be sealed and placed in a cylinder of carborundum.


BOTTLE EXHAUSTED OF AIR, FILLED WITH ARGON AND SEALED WITH FUSED CRYSTAL COVER
BOTTLE SEALED IN LEAD CONTAINER, WHICH IS ENCASED IN CARBORUNDUM CYLINDER
TIGHTLY WRAPPED SCROLL INSERTED IN MOUTH
SCROLLS UNROLL TO UNIFORM SIZE AGAINST MONEL METAL BANDS
NECK NARROWED FOR SEALING
CONTAINER MADE OF RODS OF FUSED QUARTZ CRYSTAL
RECORDS WRITTEN ON WHITE JAPANESE PAPER WITH CHINESE INK
BRAIDED ASBESTOS CUSHIONS BANDS

Records to be kept for people living 10,000 years hence will be sealed in containers as shown above and buried in earth.

Motorcycle Speeds One-Man Chemical Fire Department to Scene of Blazes

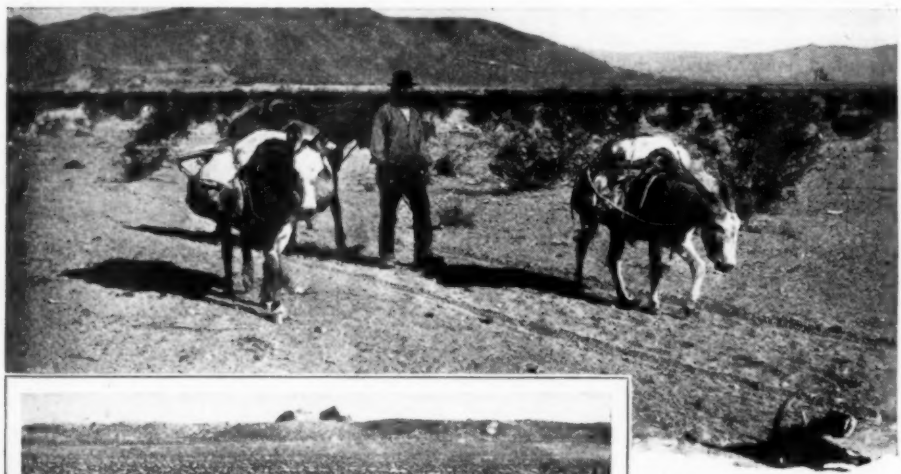


Here is the Dusseldorf, Germany, one-man chemical fire department which extinguished blazes in incipient stages.

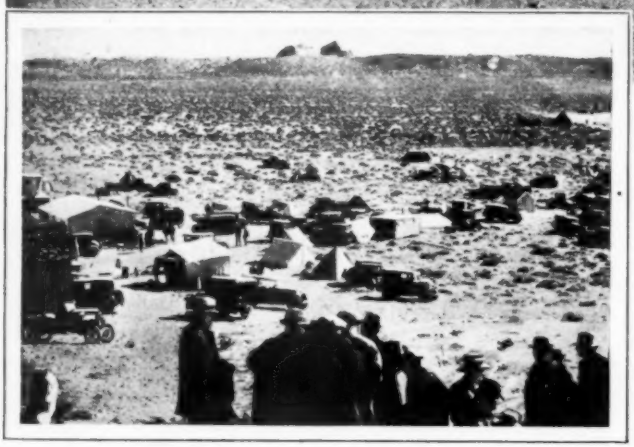
TO THE little German town of Dusseldorf goes the honor of having the world's smallest fire truck. Or, to put it more accurately, the world's smallest fire motorcycle. It is designed especially to speed immediately to the scene of a fire and get at the blazes before they have a chance to grow to larger proportions.

Chemicals are the chief weapons employed against the fires, the tank being carried on a side car as shown in the accompanying photo. Like the regular fire truck the fire motorbike carries several sections of fire hose and the inevitable fire bell. For small fires, where calling out the larger trucks would be a waste of effort. this motorbike proves ideal.

Machinery Modernizes



Gone forever is the prospector of the old days, who roamed the desert with his pack burros, seeking gold.



Prospectors of the modern school have discarded the burro for the automobile. With the car as a base camp, they prospect in a radius of five or ten miles, then move on. Photo above shows camp at Weepah, Nevada.

by **H. H. DUNN**

Engineering genius has turned the barren desert into a modern Eden, enriching the nation by nearly half a billion dollars. Read here how machinery has conquered heat, distance and bad men.

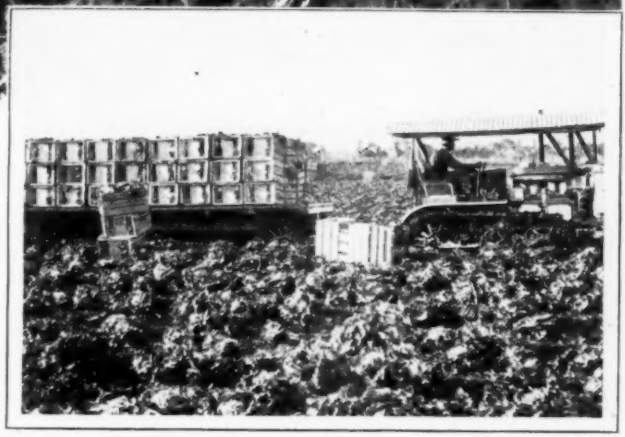
FOR more than a century man has waged war against the American Desert, yet it is only within the last ten years that he has removed from it the danger of death to its invaders, made possible a production from it of more than $100,000,000 in crops and made available to the world mineral deposits of unknown value. Machinery did it for him. From the northernmost end of the Great Basin to its southernmost merging with the wastelands of Mexico, mechanical genius and the engines it has devised have mastered every one of the nearly 200,000 square miles of barren mountain, valley and plain.

In other words, machinery has conquered the desert, added to the potential wealth of the United States by its victory nearly half a billion dollars, according to the most conservative estimates of men who have been leaders in the conquest.

Men and women who once walked and drove ox-teams across the desert in three to six months, depending on where they made their adventure, now fly over it in half a day, or drive across in motor vehicles in less than a week. Indians who once raided and then outran their white pursuers, are herded on their reservations by airplanes and automo-

the American DESERT

Even narcotics come to the aid of the desert. Here is a field of sesbania, a hemp which yields narcotics, being plowed under for fertilizer. It increases productivity of soil from 25 to 40 per cent.



Without track-laying tractors of the type shown above, lettuce fields made boggy by irrigation could be harvested only with greatest difficulty. Lettuce is crated and carried to market on trucks.

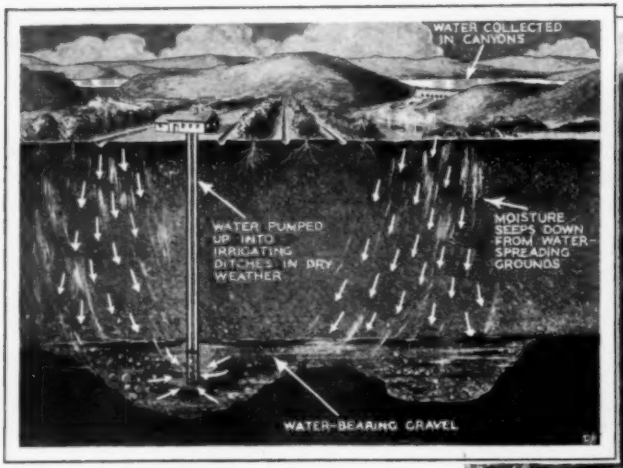
biles, while motor-trucks bring them their food. Rivers that ran upside down, with their dry beds on top, as do almost all desert streams, have been forced to yield their water. Poisonous springs have been filled and wells of good water drilled instead.

In the desert, the lakes which contain water are in valleys high in the mountains. The lakes on the plains and in the lower lands are dry, with only their bare, shimmering, white beds turned to the sun. Engineers took the water from the high lakes and piped it down onto the desert, even for 100 miles or more outside the desert, to cities on the Pacific Coast. Mining experts plowed the dry lake beds of the valleys and took from them millions of dollars worth of sodium salts, borates, nitrates and even common table salt, leached from the mud in nature's own solar vats.

From the streams which contain enough water to maintain a constant flow, such as the Gila, the Colorado, Owens and others, engineers diverted water to irrigate the lands lying below them. From one single area of these lands—the Imperial Valley—nearly $70,000,000 worth of food for man and his cattle comes this year. All this was impossible of production without applied water, and the water could not be applied until engineers ran their levels, digged their ditches, and then devised especially-designed machinery to maintain all these workings.

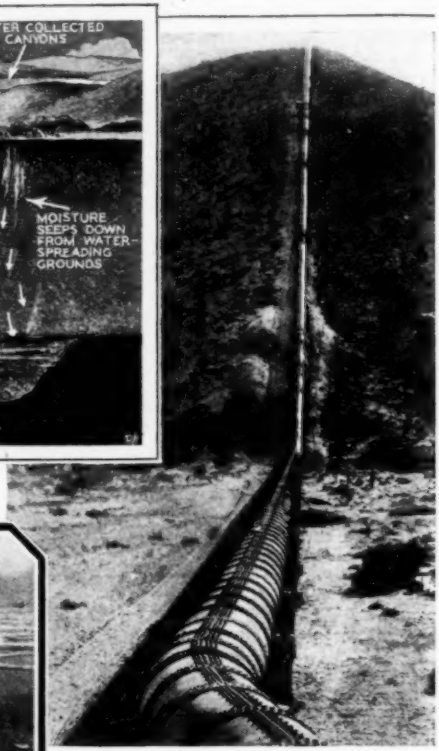
Out of this form of irrigation has devel-

Water Control Scheme Stores Water Underground for Dry Weather Use


WATER COLLECTED IN CANYONS
WATER PUMPED UP INTO IRRIGATING DITCHES IN DRY WEATHER
MOISTURE SEEPS DOWN FROM WATER-SPREADING GROUNDS
WATER-BEARING GRAVEL

In new irrigation method, rainwater seeps down into gravel beds, to be pumped up when needed.

Like its rivers, the lakes of the desert are upside down, with bottoms on top and waters, if any, beneath. More than $30,000,000 worth of salines have been taken from the Death Valley lake shown above.



Believe it or not, but one of the chief products of the desert is water. Through the world's largest reversed siphon, shown above, water is pumped from lakes high in the mountains and piped down into the desert and to cities on the Pacific coast. Inclined railway runs beside pipe.

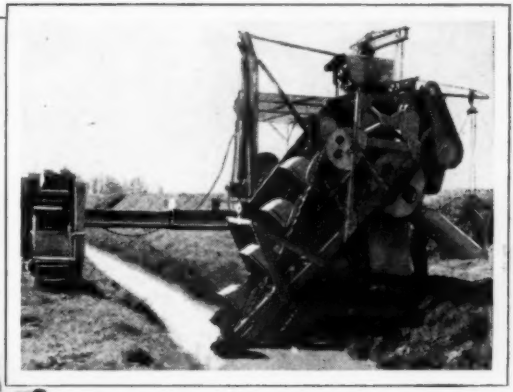
oped another, for use where arable lands are higher than the levels of the rivers. By this new method, being tried out for the second year in 1931, small diversion dams are erected in the shallow valleys of the hills surrounding a farming settlement. Rainwater in the short but usually heavy rainy season, is directed by these low-cost, dirt dams to what are known as "spreading grounds," that is, selected areas of sand and gravel which absorb the water rapidly. This water sinks to the gravel beds beneath, and is there stored—instead of running off into useless waste—until the irrigating season, when it is pumped out and applied to orchards and fields.

Miners who once prodded mules and burros step by step over the Great American Desert, today drive their cars as far as possible back into the mineral bearing ranges, establish a base camp, and prospect for a radius of five or ten miles around the car, moving the latter to a new base when they have finished with this comparatively small area. Men of means, interested in mining, fly to these ranges, inspect their properties, or look over locations made by their prospectors and fly back to Salt Lake City, Denver, Los Angeles, Phoenix, San Diego, or half a dozen other centers, well outside the desert.

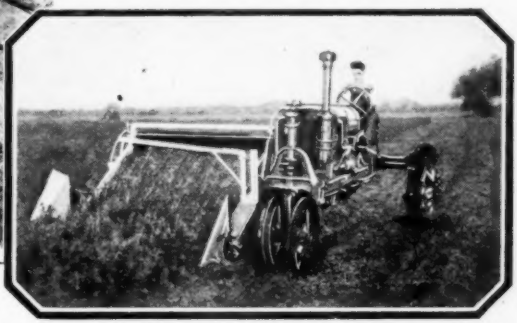
Shoulder to shoulder with the engineers who showed the way for irrigation, agriculture and mining on the desert, came the de-

Powerful Tractor Proves Most Effective Weapon in Conquest of Desert

One of the most effective weapons in the conquest of the desert is the tractor. They haul heavy trailers where there are no roads, cross unbridged gullies, and travel over rockiest terrain, demonstrated above. Autos are now taking place of tractors.



In keeping smaller irrigation ditches clear of weeds, these specially designed machines are employed. Its power is derived from a tractor, and it does the work of more than 100 men.



Harvesting of desert alfalfa crops is speeded up immensely by use of this new tractor driven alfalfa cutter, which has ousted the horse from the scene, much to farmers' profit.

signers and builders of machinery. The hydraulic engineer, looking at the Colorado river, said:

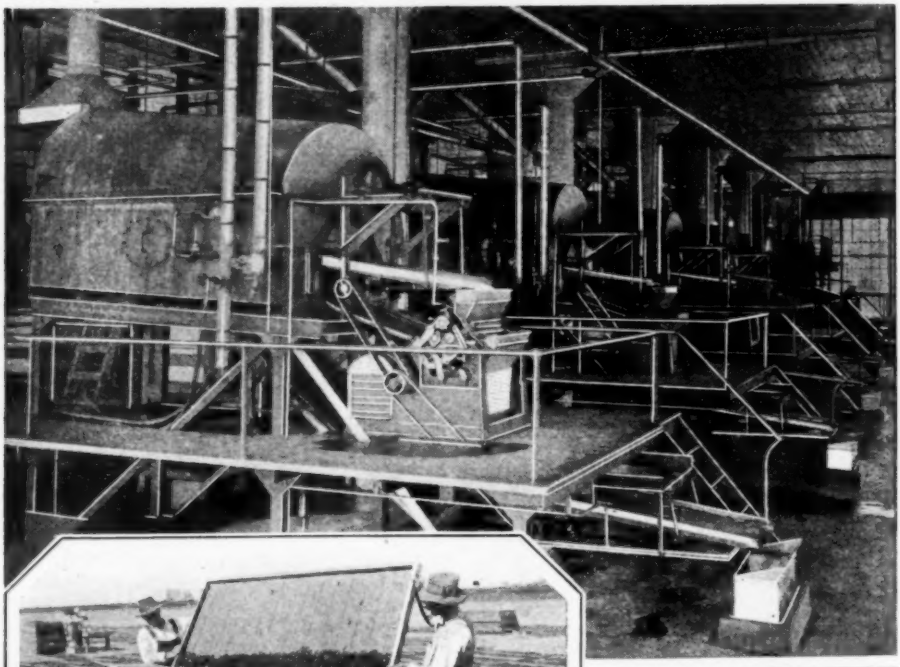
"We can put this water on half a million acres."

The machinery man said:

"Let's put it there."

And they did. The engineer ran his levels. The machinery man devised new gates, new electric controls, new and simple methods of measuring water flow and silt deposit. Then he built the equipment to handle the work, until the whole vast irrigation system of the Imperial Valley, largest in the world, is directed and actually controlled by a few men with telephones at their elbows and push-button control-boards near at hand. But when the water was on the land it was found that the soft silt made a bog of many a crop-filled field. Then they put wooden shoes on the horses, but the horses were too slow, so they put special endless tracks on track-laying tractors, and their trailers, and went right on, harvesting 12,000 or more carloads of lettuce, the largest cantaloupe acreage in the world, the most tomatoes in any one irrigated area, and so on.

When they came to alfalfa, still one of the most profitable farm crops produced, old methods did not cut it fast enough, nor lay it straight enough, so this year a new mower was designed, given exhaustive trials by the agricultural department of the University of California, and finally turned loose on the tremendous alfalfa fields of the desert. It is tractor-driven and operated, radically differ-



These machines, with capacities of 1,600 tons a day, wash, dry and remove seeds from raisins, making possible fast handling of crops. Dried raisins are poured into hoppers on floor above and come out ready for packages.

Center photo shows a simple device, a sacker for dried fruits, which permits two men to do work of eight. Below—Airplane dusting insecticides over plants to rid them of destructive pests.

ent from any mower in use, and, like other mechanical devices which have whipped the desert, it works!

Handling of the grape-fruit, mandarin, tangerine, cantaloupe, lettuce and other perishable crops of the desert by hand soon became so slow that machinery was sought to do the work. The machinery designers responded, and now, aside from picking, these products hardly are touched by hands. They are harvested by hand, placed in lug boxes, gathered up in trucks, delivered to central stations where larger trucks come and get

The sturdy date has aided immensely in breaking down desert barrier. Photo shows trees on experimental farm, with picking platform and sacks which cover dates to increase sugar content.

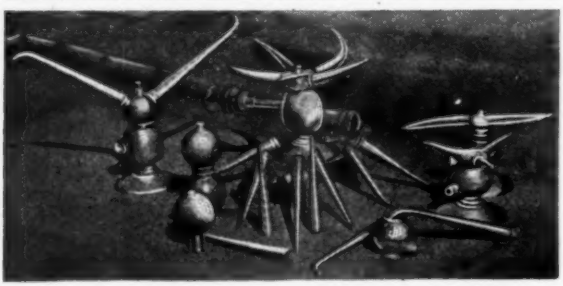
them, twenty tons at a time, and delivered to the outside of the packing plants.

There they are set, in the boxes, on endless belts that carry them to machines which grade, sort as to sizes, and fill them into boxes and crates. As they pass, still on the belts, girls stamp each of the cantaloupes with its trade mark and the date. Another machine lays down and fastens the lid and the box is ready for shipment. With the lettuce, men at machines nail the tops on the crates, aided by a machine which places and holds the lid and slides the filled container back onto the endless belt.

(Continued on page 172)

Center photo shows tourist train coming through tunnel of Funeral Range mountains in California desert. Below—Modern 8-passenger motor stage beside old 20-mule team borax wagon, largest animal-drawn vehicle, once favorite means of desert travel.

Fire Fighting Sprinklers Cover Radius of 50 to 350 Feet



New fire extinguishers spray water over 50 to 350 foot radius.

AN IMPROVEMENT in sprinkler systems for prevention of fires is represented in the invention of a wide-range revolving nozzle for checking fires in large buildings and factories. In the new scheme, a single large sprinkler delivers a whirl of water or fire-extinguishing chemicals over a radius of 50 to 350 feet, depending upon the pressure and the size of the device. Different types and lengths of nozzles may be attached to the revolving center which will increase or decrease the spread of the water.

This new fire extinguishing system, the invention of Lucian Mantell, of New York City, proved its effectiveness in a test held recently before fire officials of Philadelphia.

Trap Catches Snakes by Neck

A SNAKE trap guaranteed to collect for scientific purposes an assortment of the reptiles has been perfected by a French inventor, M. Bourdin. This box is set down in the grass so that the rows of doors in it stand open to any snake that comes along. Almost all kinds of snakes have intense curiosity about open passages like these and will crawl into them to investigate. A short distance inside each passage the inquiring snake comes to a kind of curtain across the passage, made out of flexible material like celluloid and with a hole in it. Once the snake's head is thrust through the hole it cannot be withdrawn. Any back pressure on the collar of flexible material tightens and holds the snake's head firmly, until released by its captor.

One-Child See-Saw Betters Health

GOOD health is developed in children by the use of a one-passenger see-saw now being marketed. As shown below, the device has a spring to replace the extra see-sawer, and is rocked up and down by operation of the lever and foot pedal.

Children develop sturdy arms and legs riding on this new one-passenger see-saw.

Bike Side Car for Baby Passenger

Bicycle side car for children is attached to bike frame with metal rod as shown in photo above. Springs insure smooth riding for passenger.

AT A rally of bicycling enthusiasts held recently at Hedgerly, Buckinghamshire, England, a novel bicycle side car was demonstrated which makes it possible for parents to take along their infant offspring when they go for a ride in the country. This side car, shown above, is equipped with a single bike wheel, has a bed-shaped body, and is attached to the bike frame with a metal rod.

Snow Furnace Cleans Street Faster Than 30 Teams Horses

A MACHINE employed by the street cleaning department of Koenigsberg, Germany, burns snow and does the work of 30 teams of horses. That may sound fantastic, but it works like this. The machines have huge kettles heated by coke. After a heavy snowfall, the street workers shovel the snow into the kettles, which immediately transform it into a stream of water that runs off into the street canals and sewers.

With this device the labor and cost of hauling the snow away by trucks is saved, and the task of clearing the streets is expedited considerably.

This German snow melting machine saves hauling by trucks.

Tiering Truck Expedites Loading

Materials are quickly moved from place to place and stacked in tiers with this new tiering truck.

A TIERING truck that steers with all four wheels, drives from the rear wheels and is powered with a tractor-type gas engine capable of twenty-four hours' continuous operation is announced by manufacturers.

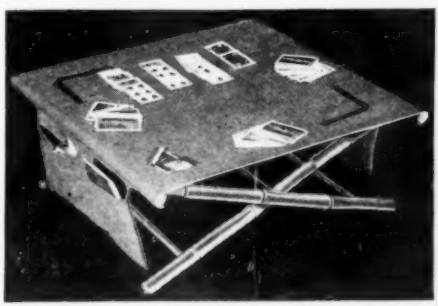
The new method by which all four wheels turn in response to the steering control, enables the truck to get into tight places with its load and get away easily. The hydraulic lift applies maximum power to point of service without drum or other complicated mechanisms.

Quake Like 20,000 Tons Dynamite

A TYPICAL earthquake, one that occurred in Jugoslavia in 1923, released as much power as the explosion of forty million pounds of dynamite. Put another way, if the power of this single earthquake had been harnessed and put to use it would have delivered the equivalent of a thousand horsepower engine running continuously night and day for four years and three months. The heat generated and distributed by this earthquake must have been equivalent to more than three thousand tons of coal, scientists believe.

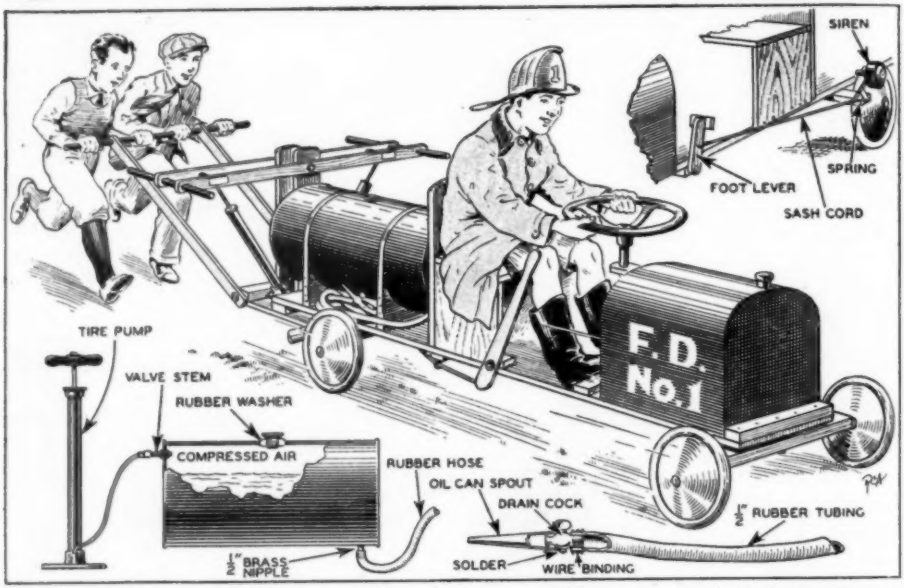
Portable Table for Beach Bridge

A LOW beach table with bamboo legs and linen cover for card playing or lunches on the beach is now on the market.



Ideal for a game of bridge on the beach is this low table with bamboo legs and linen cover.

Compressed Air Fire Engine



The fire engine is propelled by two members of the crew pushing on the bar behind. Working the pumps up and down compresses the air in the tank, and delivers a strong jet of water from the nozzle.

WITH a set of coaster wagon wheels and axles, an old auto gas tank and steering wheel, two tire pumps and odds and ends of lumber, you can build this novel little fire engine which will squirt a stream of water to a considerable height. It is equipped with a powerful brake and a siren, and is propelled by two members of the crew on the push-bar behind. Painted a bright red with bronze trimming it certainly looks like business and furnishes no end of fun making runs to imaginary fires.

The chassis is built up on a ⅞ in. or 1 in. board 12 in. wide and 6 ft. 6 in. long, with 2 in. by 3 in. axles. The steel axles are fastened to the underside with staples, or nails driven part way in and bent over. Note that the king-pin on the front axle is slightly offset so as not to interfere with the steel axle. Use three washers between it and the chassis, and put the nut and lock-nut on the top end. Build up the hood as shown in the perspective drawing, having a diagonal brace and the top horizontal member extending back to serve as a bearing for the steering post. Cut the post the proper length so that there will be ample room under the wheel for the pilot's knees, and a 3 in. extension below the floor board for a wood spool or drum, which is pinned to it, for the steering cable. The latter can be of sash cord, and should have a stiff equalizing coil spring at one end.

Brace the seat well inside, for it helps prevent the heavy tank sliding forward when making sudden stops. Near the top at the rear solder in two tire valve-stems, and at front on the bottom a nipple to which the fire hose, ½ in. rubber tubing, is to be attached. The vent in the filling plug should be stopped and a rubber or fibre washer put under it so that the tank will remain airtight. The tank is secured to a cradle by means of brass or iron straps.

Dimensions of the pump standard, etc., will depend upon the size of the pumps used. The latter should be as substantial as possible, and are secured to a beveled block at the rear of the chassis, as shown. Two holes larger than the screws to be used are drilled in the pump feet so that they can rock slightly on their wood bases. Set the ends of the pump handles in holes in the rocker arm and

Shoots Real Stream of Water

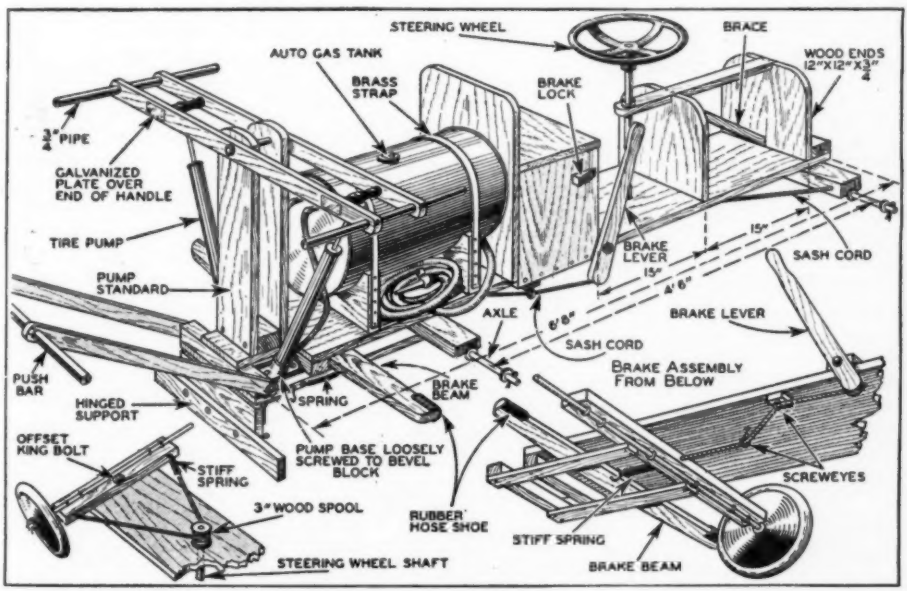
screw a square of galvanized sheet iron over the holes so that the pump handles will not work sideways. This rocker arm is pivoted on a standard as shown, and at the outer ends sections of ¾ in. pipe serve as handles. Four boys working the pumps will develop tremendous pressure over the water in the tank and force it out through the hose nozzle to a surprising distance.

In order to steady the chassis while the pumps are being driven full speed a hinged brace drops down from the rear end of the chassis. When not in use this brace is held up out of the way with a hook. The brace, of course, should be made long enough to set firmly on the ground. Note that the brake can also be locked against a block on the side of the seat.

This type of brake is very effective and can be depended on at all times. It consists of a brake beam, the ends of which are covered with sections of garden hose, and is kept clear of the wheels by two light tension springs on the sides of the chassis. A very stiff tension spring is attached on the forward side to keep it tight when the hand lever is locked.

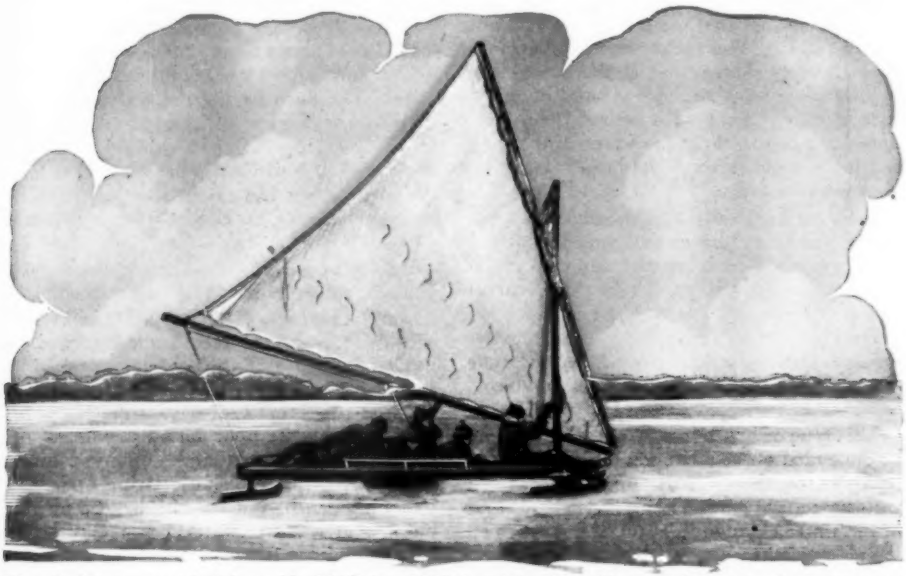
A foot lever can be installed on the left side of the chassis to operate a siren, such as is sold for bicycle use, running off the rear wheel. The push bar is attached to the rear of the chassis, as shown, and has an iron pipe for the handle. This is a safe and effective method of propulsion, as some speed can be attained and at the same time the pushing members of the crew can help hold the truck back in emergencies.

By all means give the truck a good paint job—bright red all over, with black and bronze trimmings. A little black and bronze, or gold, sets off the red to good advantage. Paint as much as possible before assembly. Wood axles, brake lever and brake bar, upright for rocker arm and handle bars should be black; floor board and back and bottom of seat gray, and dummy radiator gray or aluminum. The lettering and other trimming can be put on with bronze or gold paint, and when completed you may be assured this little fire engine will be the sensation of your neighborhood.



Drawings above give details of parts and assembly of the fire engine. When pumping the hinged support should be let down to give a solid base to the pumps. Pump bases are secured to bevel blocks.

"Scissorbill"—a Speedy



The whole gang can pitch in and build "Scissorbill," for she's plenty big enough to carry five passengers.

The "Scissorbill," so called because shears are used instead of a mast, is a simple, economical, and extremely fast ice yacht, which the amateur can build from materials picked up about the shop.

ICE-BOATING is not an expensive sport although many people think so. *Scissorbill* doesn't have to be made of new lumber; it just has to be substantial. In most cases, a boy may have enough lumber around his home to build practically all the boat.

The first section of lumber necessary is the runner plank, the timber on the ends of which the runners are bolted. This is 10′ long, 2″ thick and 10″ wide. It should be very strong as the entire weight of the boat rests on it.

Next comes the construction of the cockpit. This consists of two 10′ 2x4's bolted to the runner plank one inch from the ends and connected at the back, thus forming a triangle. This structure is held together in the rear by two pieces 1′ long and 2″ thick which separate the 2x4's enough to get the tiller post between them. These pieces should be spiked on to the 2x4's one over and one underneath.

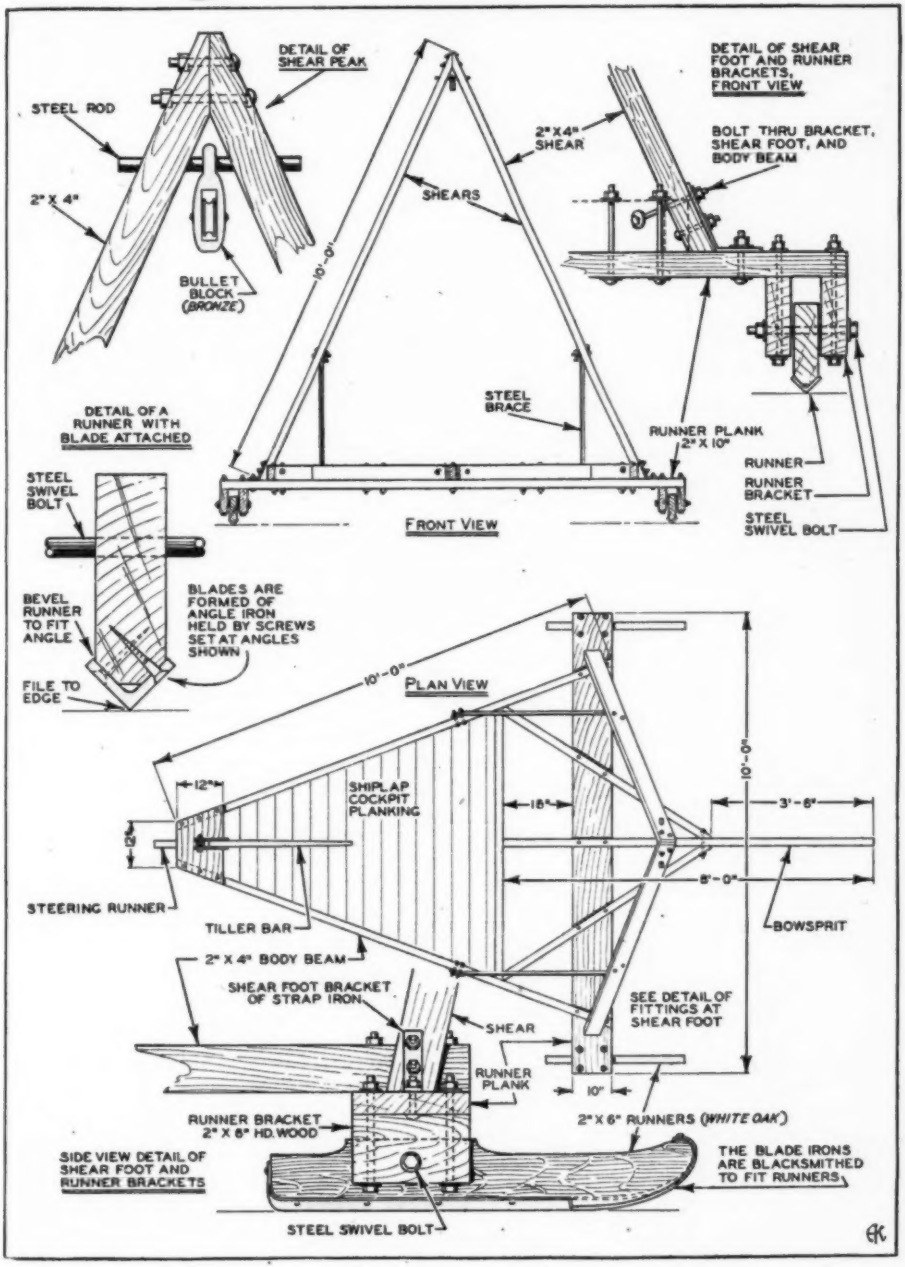
A one inch hole should now be bored through them to permit the tiller post to

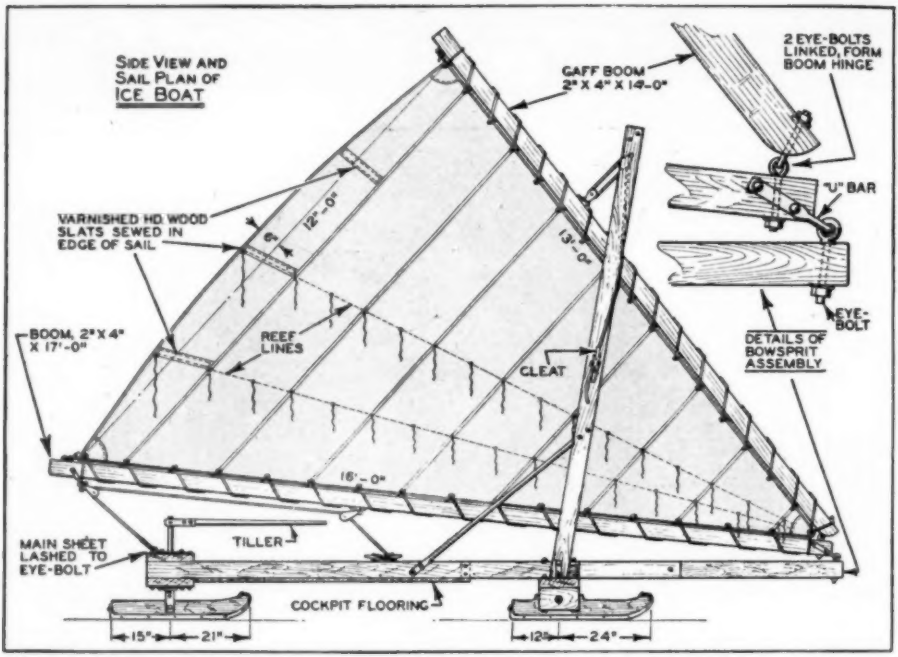
Blueprints for Building the "Scissorbill"

A set of shop blueprints from which you can build this speedy ice yacht in your own workshop can be obtained from Modern Mechanics and Inventions, 529 South Seventh Street, Minneapolis, Minn., for 50 cents. The prints are identical with those published here, except that they are the full size of original drawings—a convenient size for workshop use.

ICE YACHT

by CLARON W. LEITH

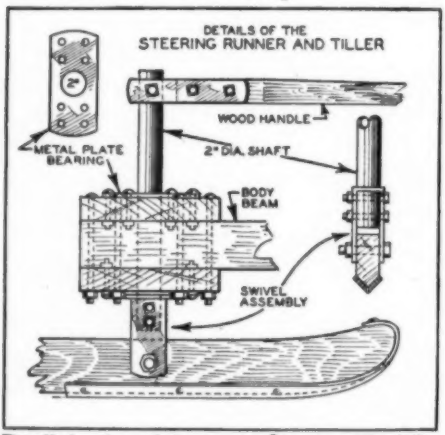




The sail is hoisted with a block and tackle hung between the shears. All seams are double-sewed.

come up through the boat. Iron plates are to be placed around the holes to prevent wearing.

Next, a 2x4 should be spiked in between the sides of the cockpit parallel to the runner plank about a foot and a half behind it. From this 2x4 on back to the rear, shiplap should be nailed on the underneath of the boat to form the cockpit.



Detail drawing of the steering runner. The tiller bar may be cut to suit the pilot.

Now the bowsprit is to be placed on the boat. It is an 8′ 2x4 placed in the very center of the boat, nailed on to the front of the cockpit and bolted to the runner plank in the exact center. Braces are to be nailed on to the outer corners of the cockpit and should extend across the runner plank where they are securely nailed to the bowsprit—they should be bolted to the runner plank where they cross it.

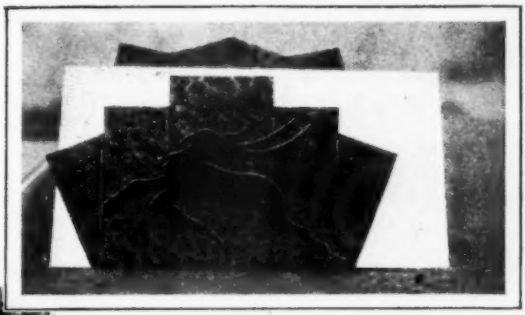
The next step in the construction of the body is the placing of the shears. These are the two 10′ 2x4's which are placed on the runner plank and are beveled and bolted together at the top to form an inverted "V". At the bottom the shears are bolted to the pieces that form the side of the cockpit.

About four inches from the top of the shears a strong bolt should be inserted to support the block and tackle used to pull up the sail. Braces are now bolted to the shears approximately four feet above the runner plank and then down to the 2x4's which form the sides of the cockpit. These braces should be of very strong steel, not band iron.

There are four white oak runner blocks,

(Continued on page 180)

Decorative Modernistic LETTER Holder

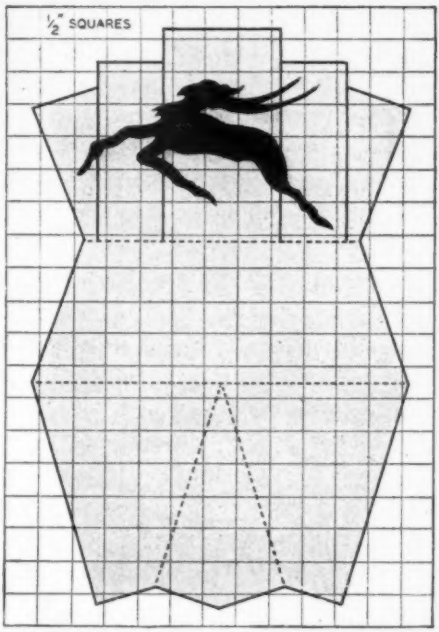


The holder is given attractive finish by hammering with ball pein hammer. Top right photo shows the completed holder with figure soldered on front.

ALL that is required to make this modernistic stationery holder is a piece of 16-gauge soft sheet copper 5¾ in. wide by 9 in. long, and a piece of 26-gauge, 2½ in. wide and 4 in. long. First lay out the pattern on cardboard, then transfer it to the 16-gauge copper, cutting it out with tin shears. With a ball pein hammer, hammer the front side down to the dotted line, then reverse and hammer out the remainder of the sheet. This done, place the sheet in a vise and bend it as shown in the photos above.

Now lay out the figure of the running deer according to the squared chart above. Trace this figure on the 26-gauge copper, cut out with a jeweler's saw, and clean up nicely with a saw and file.

The deer figure is to be sweated onto the front of the holder. To do this, clean up the back of the figure and the front of the holder with sandpaper. Apply a liberal coat of soldering paste and then tin the back of the figure with solder. Then clamp the figure in place on the holder and apply heat from a blow torch until the figure is soldered firmly all over. To clean up the piece go over it with a swab dipped in commercial nitric acid, then wash thoroughly in cold water.

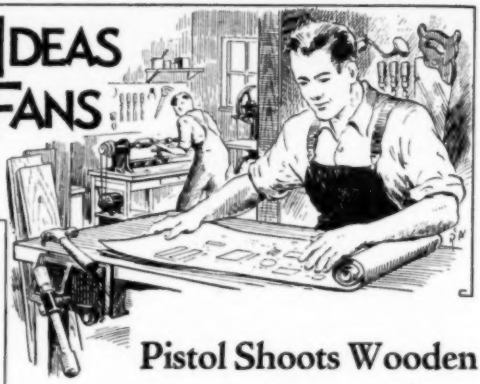


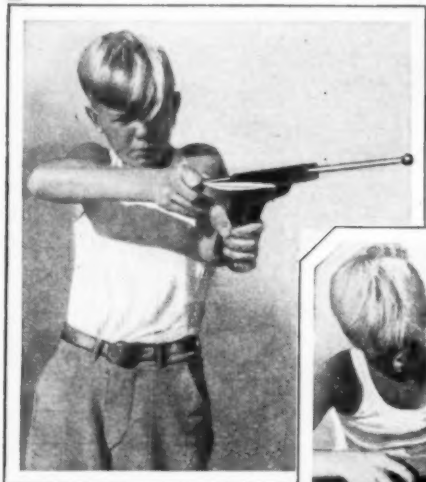
Both holder and figure are laid out from the above chart. Holder's back is flared on dotted lines.

Get a piece of liver of sulphur about the size of an olive from the drug store and dissolve in two quarts of water, and submerge the completed holder in this. Let it remain until it takes on a very dark brown color. Remove and let dry, then burnish all over, except on the applied figure of the deer, with a piece of fine emery paper. Clean up with a piece of clean cloth and apply a brush coat of good banana oil.—Dick Hutchinson.

MONEY-MAKING IDEAS FOR WORKSHOP FANS

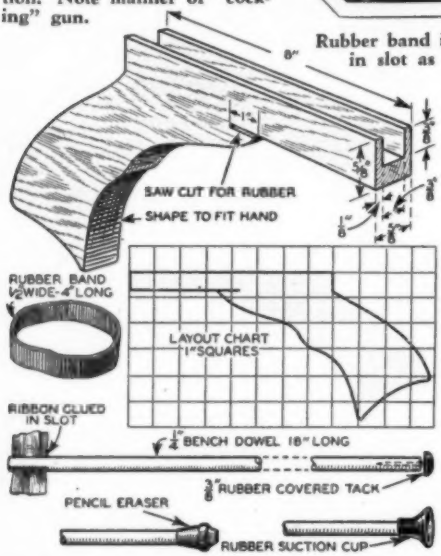
by DALE VAN HORN





Here is the arrow pistol in action. Note manner of "cocking" gun.

Rubber band is seated in slot as shown.



Handle and barrel of pistol should be cut from squared chart given above. Silk ribbon serves as feathers; tack, eraser or cup as tip. Sharp nail should be used for target practice.

Pistol Shoots Wooden Arrows

FROM a single piece of wood and a rubber band you can make an arrow gun that will shoot a rubber-tipped arrow easily 200 feet, or even more. But for the small home shop owner this novel gun presents another possibility. When the materials for construction are bought in small quantities, a number of these guns can be made for about six cents each and sold through dealers at 15 cents apiece or direct to boys in your neighborhood at 25 cents.

Cut the gun from white pine or redwood about ⅝ in. thick, free from knots, and of the dimensions shown in the accompanying drawings. Cut a slit under the barrel for one inch to serve as a seat for the rubber. The groove for the barrel can be chiseled or run out with a dado head. Finally, it should be sandpapered down to smoothness so that the arrow can fly out unobstructed.

The gun is now ready for painting. It will be highly attractive if you do it in yellow, red or orange, or, better yet, in two or more colors. The rubber band used should be ½ or ⅝ in. wide, of good thickness, and about three inches long. Simply slip it into the saw cut as shown and stretch it over the rear end of the groove.

For arrows, use birch dowels ¼ inch in diameter and 18 inches long. These can be bought for 5 cents per 36 in. in length at any lumber yard. Each dowel makes two arrows. Make a thin saw cut in one end ¾ in. deep and slip into it a square of red silk which has been touched with glue. This ribbon serves for feathers.

Nut Bowl and Mallet Makes A Handy Christmas Present

THIS two-toned nut bowl and mallet will be just the thing to surprise the folks Christmas morning. It can be used for fruit, but it is especially suitable for holding nuts. The most attractive feature that it has for workbench fans, however, is the fact that a number of them can be turned out on the lathe and sold to friends in the neighborhood who are on the lookout for a really attractive and serviceable present for their families.

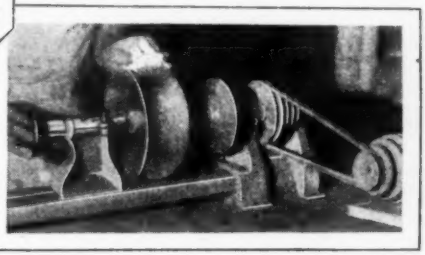
The bowl consists of a block glued up of 2¼ in. thick pieces, each 9 in. square. If matched pieces of sap gum are used you will hardly be aware of any joining. The rough turning was done on a lathe face plate, the hole for the dowel of the center block, as well as much of the inside, being cut out at the time.

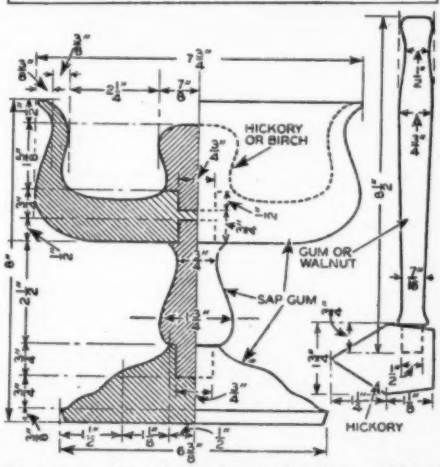
The upright spindle should be turned down to the dimensions shown in the accompanying drawing, but left slightly oversize, save for the dowels, which were turned for an accurate fit. The base, also, is turned on the face place, but left slightly oversize, and the hole turned for the lower end of the spindle.

Finally the hickory plug was turned rough and the dowel carefully shaped to make a snug fit into the hole of the bowl. When this has been done the glue should be applied to the joints, the pieces quickly assembled, and then reinserted between the lathe centers, as illustrated in the accompanying photo. The tail stock center should then be screwed up until the surplus glue is forced from the joints and everything is snug fitting. The piece should be left in this position for 24 hours.

After a final trimming up, the surface can be sanded with Nos. 0, 00 and 000 sandpaper in the order named and finished with fine steel wool. Finally, apply the usual coats of lacquer, each dried in the lathe while spinning, and polished with a rag and the bare hand before the application of the next coat.

Note the graceful curves of the completed bowl. Nuts are cracked on center knob.





Four parts of bowl—knob, spindle, base and bowl—are turned down on the lathe to dimensions shown above and glued together. At right is shown dimensions and assembly of mallet, which is turned from two pieces of hickory.

Granite Crib-Work Bridge Withstands Heaviest Currents

10,000 tons of granite built this Casco Bay, Maine, roadway.

IN LOWER Casco Bay, Maine, a bridge of unusual type connects Orrs and Bailey Islands. It is 1200 feet long and except for an 80 foot deep water channel near the center is constructed of granite slabs or blocks laid criss-cross on a foundation of natural ledges.

A span across the channel gives 10 feet clearance on the highest tides, thus permitting the passage of the small fishing boats which use the route. The top of the bridge is a 20-foot concrete roadway. The cellular form of construction permits the free flow of the tides which run strongly through this gut. Crib-work bridges of this size are most unusual. More than 10,000 tons of granite were used.

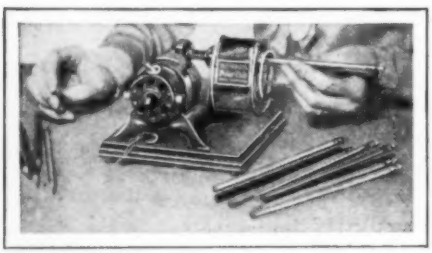
Aspirin Revives Wilted Flowers

FOR some unknown reason an aspirin tablet dropped into the water in any vessel holding cut flowers will tend to revive slightly wilted blooms and restore them to their former sprightliness. Some varieties of roses are especially sensitive to treatment of this sort. Of course it must be understood that flowers that are completely dead cannot be revived by this or any other means.

Motor-Powered Pencil Sharpener

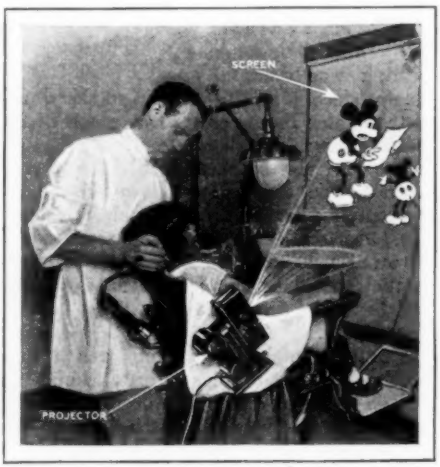
PENCIL sharpening is an effortless job when there is used a pencil sharpener driven by an electric motor now on the market. Furthermore, unlike most hand-operated sharpeners, the new machine has a series of different-sized openings, so that it can be used to sharpen pencils of almost any size.

The device has an opening and a transparent case like the ordinary hand sharpeners. The pencil is placed in the open end, a little switch on top of the motor is thrown on and the little machine sharpens the pencil neatly and quickly.



Pencils of any size are sharpened by inserting them in the new motor-powered sharpener shown above.

Movies Entertain Dentist Patients



Mickey Mouse movies, thrown on screen by portable projector on arm of chair, entertain patients while dentist extracts teeth.

AS a means of taking the patient's mind off the drill that is gouging down in his tooth, dentists are now providing distracting entertainment in the form of movies. In this scheme, employed by Dr. A. G. Highgate of Wauconda, Illinois, a small portable movie projector is attached to the arm of the chair, and interesting movies are projected on the screen before the patient while his tooth is being extracted. The scheme is winning wide favor, especially among children.

Things to Make with Tools

Edited by A. NEELY HALL

Hang Clothes on Tails of Little Monkeys

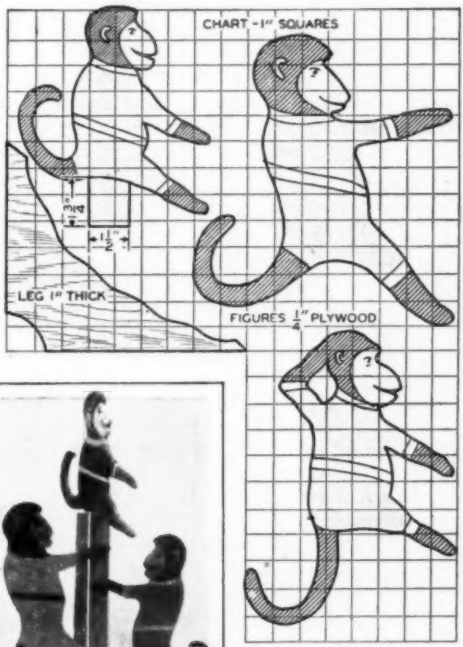
IF YOU'RE looking for something novel and ornamental in the way of a clothes hanger, here it is. Such a hanger is very appropriate for the children's room, and will probably prove an inducement for keeping clothes in their proper places.

The little monkeys should be made from ¼ in. plywood. It's a good idea to cut out the figures first, laying them out on cardboard according to the squared chart diagram below. Then trace out the monkeys on the plywood, and bring your coping saw into action, taking particular care to keep the tails intact. Finally sandpaper the figures and apply paint according to your ideas of a good color scheme.

The arms and legs of the tiny simians are nailed or screwed to the upright as illustrated in the accompanying photo. This upright piece is simply a post 1¾ in. square, with corners rounded or beveled. Size and shape of the feet, which are screwed to the bottom of the post, are given in the accompanying chart. In the top a mortise is cut to take the tenon of the monkey that sits atop the post.

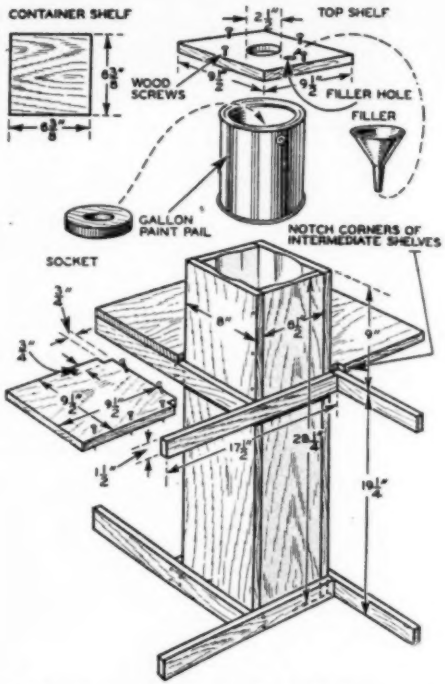
The last thing to do is to screw or nail the arms and legs of the monkeys to the upright, as illustrated, and then give the whole thing a coat of varnish or paint, just as you wish. Brilliant color combinations are usually best suited to this type of article.

Clothes are hung on the tails of the little monkeys, which appear to be climbing the pole. The simians are attached to the upright with bolts or nails through their arms and legs.



Above is given the chart for laying out the monkey figures on plywood.

A Sturdy Christmas Tree Base and Plant Stand in One



In the photo at the left is shown the completed stand doing duty as a plant stand. At Christmas time, the tree can be inserted in top and shelves are then used to hold the gifts. Plans are given at right.

YOU will feel like investing the time to build this Christmas tree base, since it has been designed for the double purpose of tree base and plant stand, and can be used the year 'round. The base has shelves on which to place small gift packages and which are arranged to make a symmetrical stand to admit plenty of light and air to the plants.

Build the tree base and plant stand of ¾-inch stock. Pine, whitewood, redwood, cypress, gumwood, or other close-grained wood should be used for a paint, lacquer or enamel job.

Plans and photo above make construction procedure clear. Cut the side boards of the pedestal by the patterns and nail them together with the narrow boards placed between the wide boards.

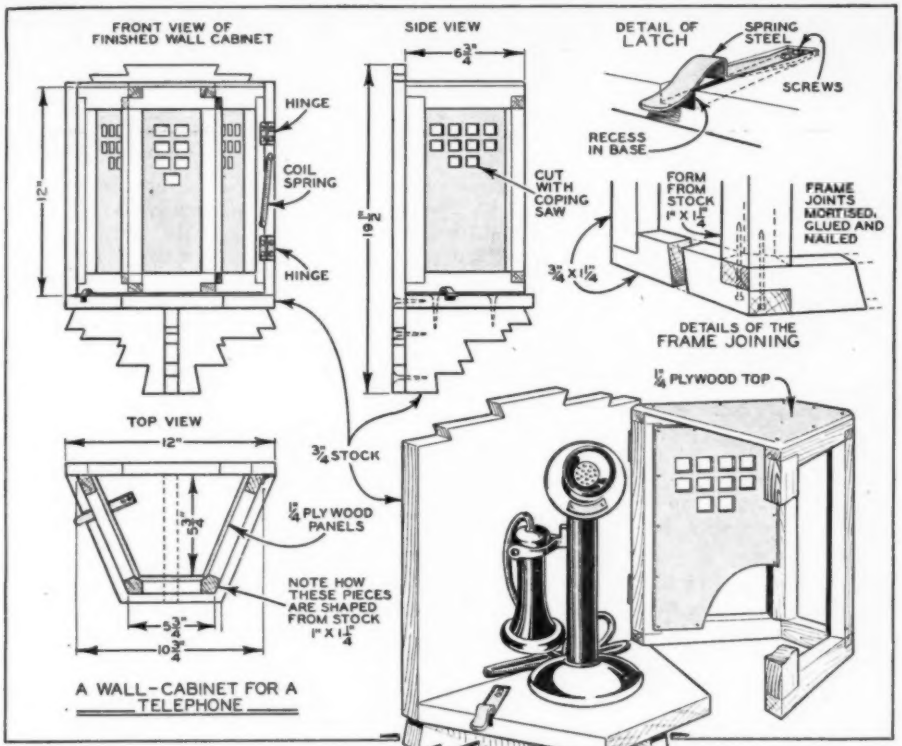
Cut eight shelf brackets of the size shown. Nail four of these to the pedestal, even with the bottom, placing them so that the ends project. Then scribe a line around the pedestal 19¼ inches above the bottom and nail the other four brackets to the pedestal, along the line, with ends projecting like the bottom bracket ends.

Cut nine shelves of the size illustrated in the drawing. Bore a 2½-inch hole through the center of the top shelf to admit the tree trunk.

Nail the four square shelves to opposite sides of the pedestal, then fit the notched shelves between them. Trim adjoining edges flush with one another, and sand them smooth. Drive nail heads slightly below the surface. Get a gallon size paint pail for a water container and cut a round block of wood to fit inside it. Bore a hole through the block of the same size as the hole bored through the top shelf. Cut a container shelf of the size shown to support the pail and fasten it inside the pedestal at the right height so the pail will be just below the top.

Aluminum makes a neat finish for the tree base and plant stand. Shellac undercoating is applied first.

Decorative Wall Cabinet for Telephone



Swinging cover, shown above, is built-up frame-work of ¾-in. by 1¼-in. pieces with joints mortised and joined with finishing nails.

Telephone sits on base shelf as shown here. Pressure on latch opens door.

THIS simple wall cabinet completely encloses the telephone and springs open instantly when you press the latch. Its construction involves only the simplest kind of cabinet work.

If the cabinet is to be finished in natural wood the material should be selected for attractive grain but white pine or redwood are suitable if the job is to be painted over.

First make the backboard bottom piece and support of ¾-inch material using screws and glue to fasten them together. Bore a hole in the base for the phone cord. The swinging cover is a built-up frame-work of ¾-inch by 1¼-inch pieces with joints mortised, glued and fastened with finishing nails. Holes should first be drilled for the nails to prevent the wood splitting. Make the joints as neatly as possible and see that the frame squares up properly.

Cut plywood top and panels to fit. These should be ¼-inch plywood, the openings in the panels being cut with a coping or scroll saw after holes have been bored to admit the saw blade. Use a fine tooth saw to prevent tearing edges and smooth thoroughly with sandpaper. Fasten panels and top with glue and brads.

The finished enclosure should be swung with small brass hinges on the right side and a coil spring installed with one end on the backboard and the other on the enclosure, after the manner of a screen door spring. A stiff spring from a mouse trap is suitable for this purpose.

For the latch use a strip of steel or stiff brass, bent in the manner shown in the above drawings, with a recess in the baseboard beneath it.—Hi Sibley.

MOTOR MECHANICS

Edited by RAY F. KUNS

Make Your Own Hot Water Auto Heater

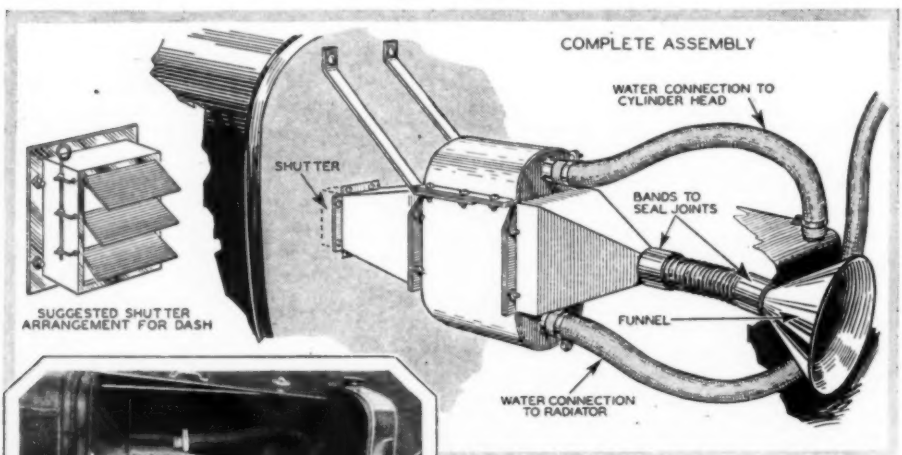
AT A cost of less than three dollars, anyone who can use tin snips, a drill, hack saw, pliers, and a soldering iron can build his own hot water auto heater. The materials required are:

A used tubular radiator.
300 sq. in. of 20 ga. bronze stock.
300 sq. in. of 20 ga. galv. sheet iron.
An old five gallon lard can.
3 feet of 2″ flexible metal tubing.
A 4″ piece of 1¼″ brass tubing.
7 ft. rubber hose with 1¼″ inside dia.
A large funnel.
2 ft. of ⅛″x½″ strap iron.
Miscellaneous wire, bolts, and nuts.

Begin by cutting three sections 4″x4″ from the best part of the radiator, and expose about ⅜″ of the tubes at both top and bottom. Test each tube and repair any accessible leaks; plug both ends of inaccessible leaky tubes. Bind the three sections very securely in tandem, with all tubes vertical.

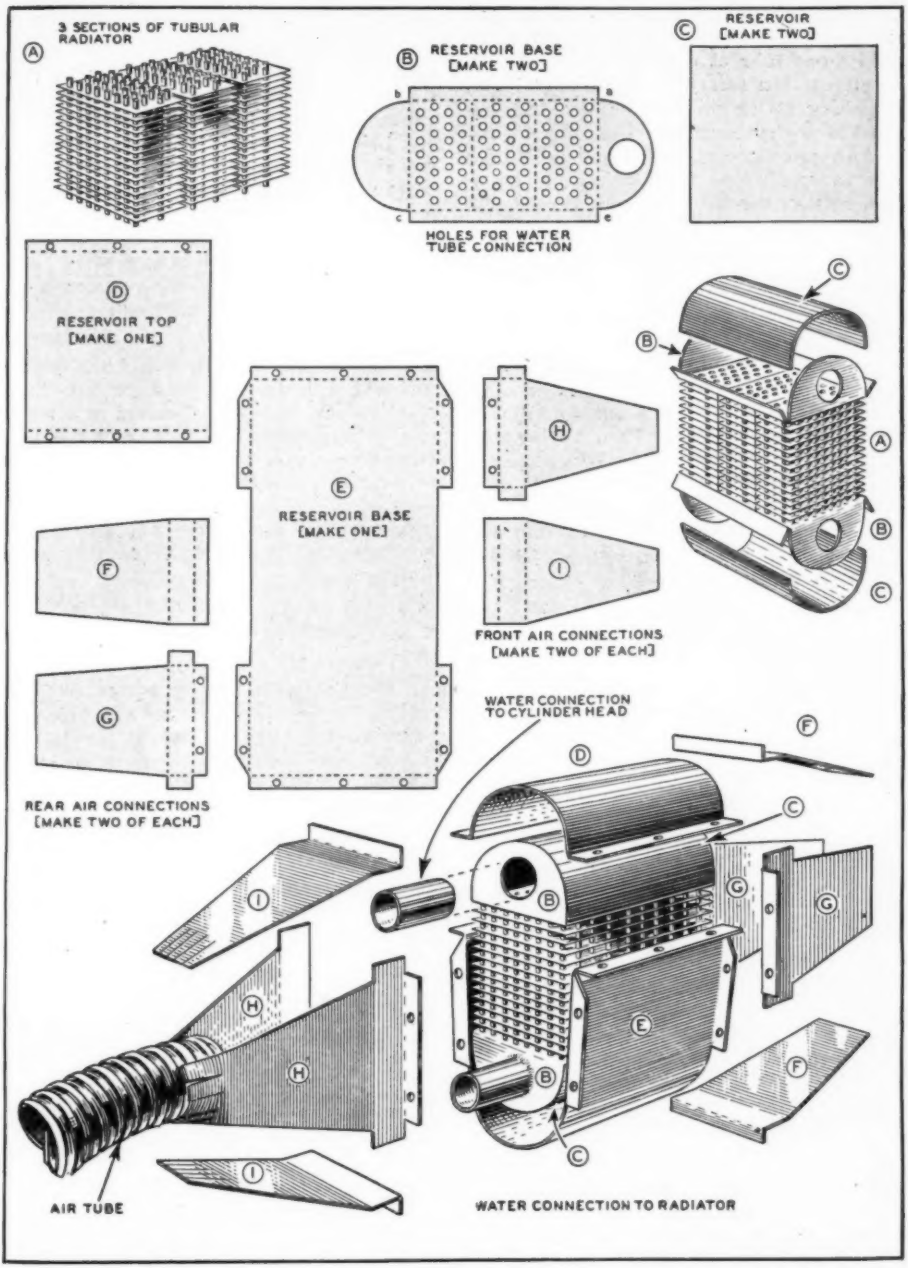
From the bronze stock a reservoir is made at both top and bottom of heater. The pattern for the reservoir base (B) is made by laying a piece of paper over either end of the assembled radiator sections and rubbing over it with a soft pencil to show tube locations. Transfer to bronze stock with center-punch; drill tube holes to give tight fit. Dotted lines a b c e give radiator assembly outline. Cut a hole at one end for the water tube connection. Crease along these dotted lines, raising the ends approximately 45 degrees and sides approximately 100 degrees.

A separate pattern had better be made for each reservoir, though it should be the same if the radiator sections are bound together properly.



The drawing above shows how your heater will look when assembled, while the photo at the left shows it installed in the car. Dimensions are not given as they will vary with the material available and the type of car in which the heater is installed. A shutter, such as the one shown here, may be purchased from an auto supply house, or you can build it yourself. Water connections should be tight, and the whole checked for leaks.

Dimensions of Heater Will Be Governed by Size of the Radiator Sections



Patterns for the various pieces needed are given on this plate. The dimensions will be decided upon when the three sections of radiator have been assembled, but the general proportions shown here should be followed. The assembly drawings show how the various pieces should be fitted together.

Clean radiator tubes at one end with zinc cut nitric acid and a wire brush to remove every trace of grease and dirt. Then clean reservoir base similarly and fit onto tubes. Solder one tube at each end to hold base in place; then solder the remaining tubes, beginning at the middle and working outward to prevent warping. Use cut acid, not soldering flux or flux solder, and sweat each tube in separately. If tubes are not seamless, be very careful not to oversweat them, as this will cause leaks below the reservoir base.

The operation is repeated for the other reservoir base, and the tubes are again tested, since leaks may have been produced in this process.

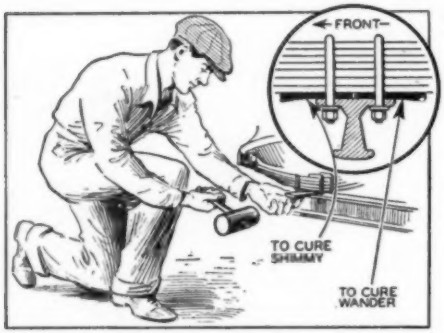
Solder two-inch sections of the 1¼" tubing into the ends of the reservoir bases for water connections. Sweat solder onto each side for rigidity. Then spring rectangular sheets of metal (C) into place for the reservoir. These sheets are of the same length as the heater (a-b). The ends are pressed up to the reservoir, and the side flanges are pressed down against the top and each soldered well.

The cover (D and E) is then cut, drilled, and fitted.

The front air connection is made of four segments (H and I) of any thin sheet metal, such as the lard can. Bolt the bases of the side pair to the flanges on the heater cover; slit the opposite ends of the cone segments, and bind them around one end of the flexible air tube and solder in place. Cut the other two segments to fit, and solder them to the first pair, making a spring fit against the reservoirs. Solder their apexes to the air tube, and solder a bronze sleeve over the resulting rough looking connection. A funnel is fitted to the front end of the air tube for obvious reasons.

A similar air connection is made for the rear end of the heater to fit against the automobile dash, in which a square hole is cut to a convenient size. The area of this hole should be about twice that of the air tube in front of the heater to allow for the expansion of the heated air. A shutter can be bought, or one can be made as shown. The heater is supported on the dash by strap iron brackets.

Tips on Securing Proper Alignment to Cure Wander and Shimmy



This drawing illustrates the method of driving wedges between the front axle and spring to cure wander and shimmy. Care should be taken that the wedges are not too thick.

CARS which wander about the road usually do so because of the fact that they are not properly aligned with reference to caster and toe-in. Caster is that quality of front axle design which causes the car to straighten itself out after having rounded a curve.

Sometimes in order to prevent a car shimmying mechanics will place wedges under the springs from the front end. This practice is O. K. as long as the shims or wedges placed are not too thick. If too thick, a reverse caster is secured and this causes the car to wander.

Take Out the Boot for Shimmy

AUTOMOBILES which insist on shimmying should be checked to find whether or not the front wheels are balanced. Sometimes the casings are old and have been repaired by means of inner shoes or boots. If these must be used, balance one with another on the other side, otherwise shimmying will set up.

Viscometer Shows Condition of Oil

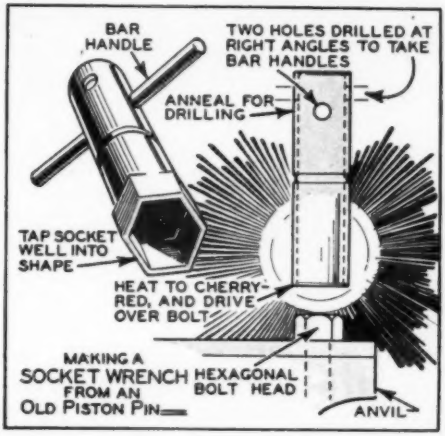
A NEW device tells at a glance just how well your oil is lubricating. Applied to an auto, motor boat, or airplane, it shows when the oil should be thrown away and when it is safe to continue using it.

The new Viscometer.

Discarded Piston Pins Make Good Socket Wrenches

DISCARDED piston pins make good socket wrenches if they are first heated to a cherry red and then driven down over the end of a bolt or nut. Hammer the sides in to form a nice "hex."

Anneal the other end of the piston pin and drill a ½" hole through it to form the hole for the wrench handle.


BAR HANDLE
TWO HOLES DRILLED AT RIGHT ANGLES TO TAKE BAR HANDLES
ANNEAL FOR DRILLING
TAP SOCKET WELL INTO SHAPE
HEAT TO CHERRY-RED, AND DRIVE OVER BOLT
MAKING A SOCKET WRENCH FROM AN OLD PISTON PIN
HEXAGONAL BOLT HEAD
ANVIL

Handy socket wrenches of various sizes are easily and quickly made from discarded piston pins.

Don't Use Ethyl in Camp Stove

DO NOT use Ethyl gasoline in the camp stove. It will clog up the nozzles and aside from that health authorities advise against the use of Ethyl gasoline where it is handled on a common touch with the hands.

The Cragg tire tool performs all operations.

Here's a Complete Tire Tool

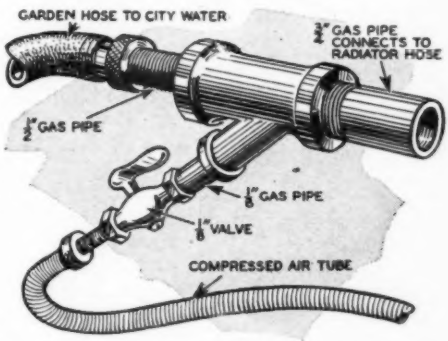
THE new Cragg tire tool makes tire changing a quick and simple matter. This tool is a combination tire iron and tire spreader, the handle having a thin tapered end that is an excellent tire iron. The curved and hook end is a tire spreader used to spread the tire open to inspect the inside and locate the cause of the trouble, and to put in the tube and flap. The tool has a powerful leverage that permits spreading of the tire with very little effort.

The speed and ease with which a tire can be changed on the road with this tool makes it an exceptionally handy accessory for any motorist.

Why Not Clean Your Radiator?

WHEN the radiator becomes clogged secure a good radiator cleaner and place this in the cooling system. Throw a blanket over the car and run until the engine has been brought to about 200°. Drain off this cleaning solution and loosen the lower hose on the radiator.

Fill the cooling system from the garden hose, with the water flowing through from the bottom of the radiator upward and then inject spurts of air by opening and closing the valve. This admits air into the water and drives it through the radiator, breaking loose and carrying away scale. Under no circumstances use an item of this kind with the thermostat in. A large water outlet will prevent the radiator from bursting.



Build your own cleaner from the drawing above.

Automatic Heater Protects Greenhouse Plants From Cold

The electric heater is laid on the floor of the heating compartment beneath the hotbed as illustrated here. Thermostat control automatically protects plants against sudden temperature drops.

AN ELECTRIC heater with thermostat control automatically protects plants against sudden temperature drops and is easy for the amateur or professional plant raiser to use as compared with steam, hot water or manure.

The heating element is laid upon the floor of the heating compartment beneath the propagating bench, hotbed, or generator. The thermostat is simply a blade of metals so constructed that the circuit is made or broken when the set temperature differs by a few degrees from that of the surrounding temperatures. When the sun or greenhouse heat brings up the ground temperatures the thermostat automatically shuts off the current. The heater is always ready to use, is clean and agreeable to work with, and does not give an excessive warmth that would burn the plant or shrivel the roots. The heater, which is in the form of a sliding frame, may be used on a 110-volt alternating current circuit of any frequency.

Martian Life May Exist on Earth

THAT kinds of life which originated elsewhere in the solar system not only have reached the earth in past ages but still are here in much the same forms as when they arrived is the opinion of a Viennese scientist. Striking evidence is supplied by the bacteria which live in salty, desert regions and develop red colors, like the prevailing red color of the planet Mars.

Electric Pony Bucks and Trots

A NEW entertainment device which holds lots of fun for the youngsters is an electrical pony invented by Otto Hahs, a mechanic of Sikeston, Mo. The pony is operated by electricity and is set in motion by depositing a nickel in a slot in the neck of the beast. The pony lopes, trots and bucks, the rider regulating the gait with the bridle reins, to suit his tastes.

Coin-in-slot makes pony lope, trot or buck.

Blinkers for Racing Greyhounds

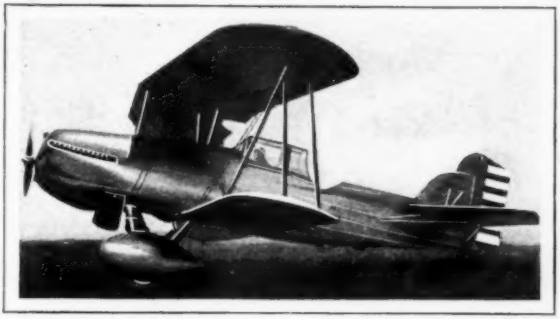
Blinkers on muzzles adopted by London Greyhound Racing Society helps dog focus attention on rabbit and prevents snapping at rival on course.

MANY a racing greyhound has lost the race because he stopped to bite a piece of meat out of his rival. To prevent such deplorable happenings the Greyhound Racing Association, of London, has adopted a new type of muzzle which is fitted with light weight blinkers, intended to help the dog focus its attention on the rabbit and keep him from snapping at the dog beside him. Made of light weight wire, the muzzle in no way interferes with the dog's speed, and keeps his mind where it belongs.

Speedy Observation Planes for U. S. Army Air Service

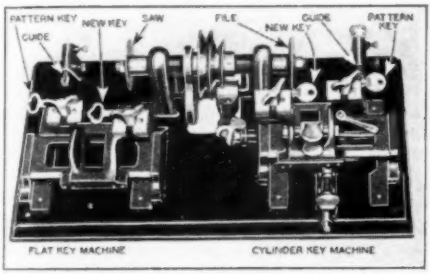
THE first of a new type of Curtiss Falcon observation planes for Army use has recently passed its tests at Mitchell Field. This ship has a high speed of 176 miles an hour, which is only slightly slower than that of the pursuit type planes, now the fastest in the military service.

A feature of the new plane is the elimination of two-thirds of the radiator by the chemical cooling of the 600 horsepower engine. The model will be known as the O-30.



The new Curtiss O-30 observation plane does 176 miles per hour. Note the enclosed pilot's cockpit and the small radiator.

Automatic Key-Cutting Machine



A micrometer adjustment enables a new key to be cut slightly oversize if old key is worn with use.

A NEW method of automatically cutting keys of all types has been introduced by a Minneapolis firm. A screw feed automatically feeds the carriage for duplicating all makes of flat or cylinder keys and the lever cuts of bit keys. Automobile keys may be cut by code without any depth keys, guides, masters, or patterns of any kind.

Heath Parasol Sets New Record

THE Heath Super-Parasol, which has practically monopolized light plane speed records at the National Air Races for the past half dozen years, recently stepped out and annexed the world's light plane altitude record.

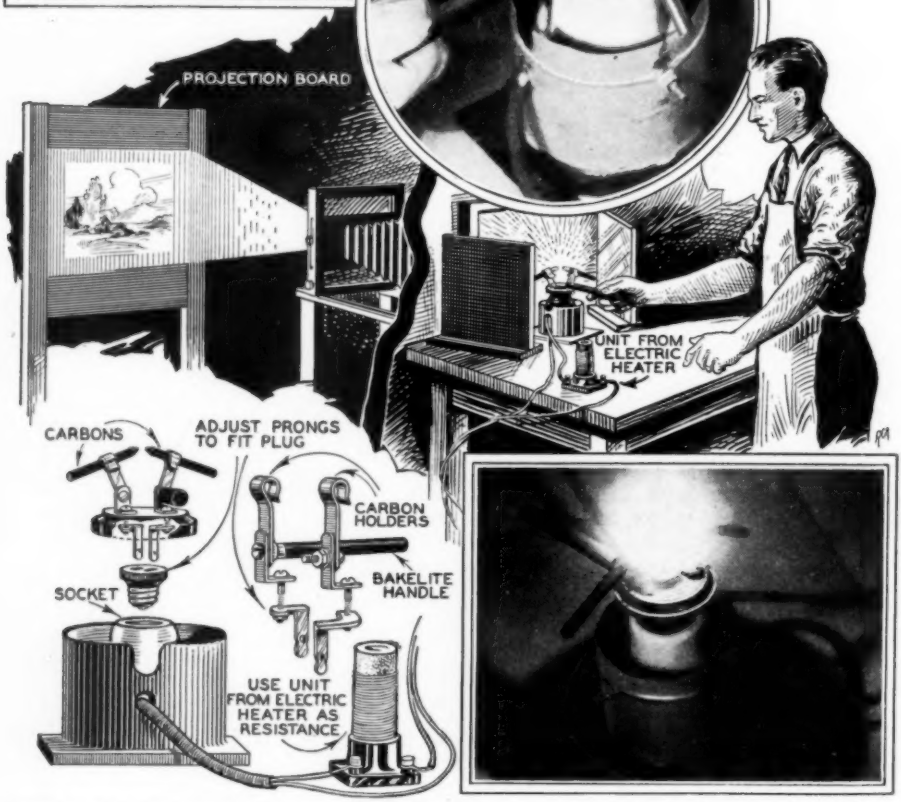
With the thermometer registering 96 degrees on the ground, Merrill Lambert climbed into his tiny plane at Niles, Michigan, and kept the stick back until his barograph read 19,000 feet. The temperature at that height was 26 degrees Fahrenheit. The long glide back to earth took 25 minutes, and Lambert was perspiring copiously when he peeled off his heavy flying clothes.

The barograph, officially sealed before the flight by a representative of the F. A. I., was sent to the U. S. Bureau of Standards and there checked with a master barograph and corrected to sea level base and for temperature variations. The official reading was established as 17,907 feet. This surpassed by 872 feet the previous world's record.

Merrill Lambert and the Heath Super-Parasol in which he established a new world's light plane altitude record of 17,907 feet. The plane is powered with a Szekely SR-2 35 h.p. air-cooled 3-cyl. motor.

An ARC LIGHT for Your Enlarger

IF YOU are a photo enthusiast operating your own dark room and desire to increase the flexibility of your enlarger you will find this easily constructed and inexpensive arc light a powerful and efficient projection lamp for your work. This arc is several times as powerful in actinic rays as the common incandescent lamp of 250 to 400 watts, and with it you can make the enlargements on contact paper, which is somewhat cheaper than standard enlarging paper, and permits the use of a greater variety of emulsions.



The arc unit is constructed and operated as shown above. The bakelite handle adjusts the flame.

The completed arc unit is so constructed that it can be used with an ordinary light socket. A light bulb can thus be substituted for it at any time, and vice versa. The unit is mounted on the lower part of a separate appliance plug, as shown in the photos at the left. The hard rubber support for an old radio rheostat forms the base of the arc unit proper.

The carbon support brackets are held in place by the same bolts which hold the contact prongs. These brackets are simply small pieces of brass bent at right angles and drilled to receive the bolts. To these angle pieces are fastened strips of spring brass bent at the upper end to receive the carbons. One carbon holder is held with a spring washer under the bolt, so that it can be adjusted with the fingers when the arc is not burning. The other holder is likewise adjustable, but the position of this is controlled by the bakelite insulating handle which is used for starting the arc and adjusting angle of the arc in controlling the length of the flame.

White flame carbons about ¼ inch in diameter are used. These can be obtained at almost any photographic supply house. When the lamp is operated on alternating current the carbons should be cored.

The arc will operate satisfactorily on about 50 volts, so a resistance must be connected in series with one of the leads to cut down the potential. If 110-volt house current is used, a 550-watt electric heater unit with about one-third of the wire removed will serve the purpose efficiently. These resistance units fit into the standard socket and hence it is only necessary to cut one side of the line and hook the socket in. Into this the resistance unit can be screwed.

To start the arc, bring the carbons together until the tips touch, and then separate slightly, using the bakelite handle for controlling the movement. The arc is adjusted in position so that it provides an even illumination over the entire negative. When enlarging an average negative with a condensing enlarger, and a lens opening of f:6.8, the exposure on average contact paper is about 20 to 30 seconds. A little experimenting will give the proper time. The arc projector tends as a rule to bring out all details of the negative very clearly.

Such an arc will also do duty in a low-powered searchlight. With a good reflector and a clear lens, you can project a beam of light for a surprising distance.

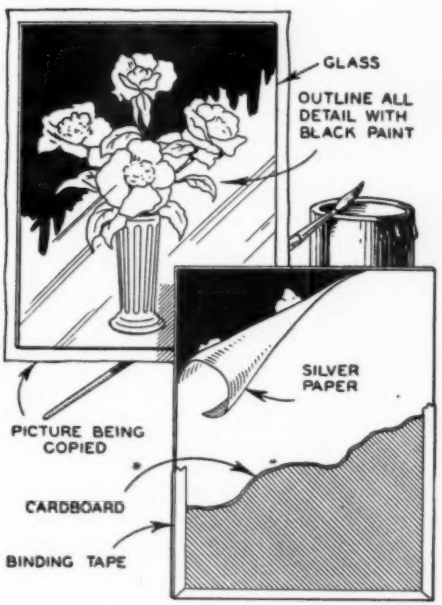
Novel Pictures on Glass

VERY beautiful and attractive pictures that make novel ornaments for any wall can be made by any person with little ability in art work, with a few inexpensive materials. Pictures of birds, flowers, and boats are good subjects for this work.

First select a picture with few details and place over it a piece of clear glass. The details are then carefully drawn in with some kind of black paint, and the entire background carefully filled in with some black paint, only the space occupied by the picture being left clear.

When the paint is dried the clear spaces in the glass are filled in with water colors corresponding to the original picture. When these colors are dried the entire picture is backed up with a piece of silver paper, which can be purchased at any book store. The transparency of the water colors allows the silver paper to shine through, giving a very artistic effect.

Very pleasing results are obtained by leaving a clear border and framing the glass with passe-partout tape. The bottoms of trays can also be ornamented in this manner.



The details are outlined and the background filled in as shown above. Silver paper on back shining through colors gives an artistic effect.

Have JUNE Weather All

by
Maurice I. Flagg

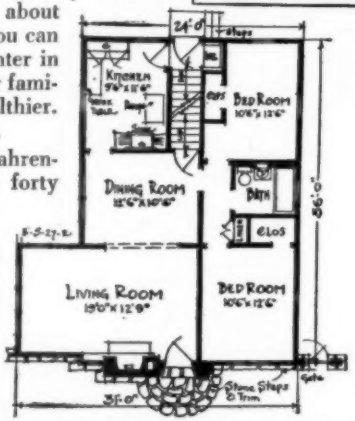
Bitter winter weather outside but comfortable June weather inside is possible if you build your new home according to the plans Mr. Flagg offers in this article. You'll notice a difference, too, when paying your fuel and doctor bills.

Spanish type house, Plan No. 5-S-27, has four bedrooms, a decorative chimney and a high resale value—all within a $6,000 price range.

Done in either face or solid brick, Plan 5-BV-17 duplicates the plan of house 5-S-27. Ask for 5-BV-27 if you want blue print for brick construction.

"EVERYONE complains about the weather but no one does anything about it," said Mark Twain. All of which may be true as far as outside weather conditions are concerned. But inside your home you can do something about the right kind of heat. You can control it and live all winter in balmy June weather. Your family will be happier and healthier. Fuel costs will be lower.

Sixty-eight degrees Fahrenheit as temperature and forty per cent humidity or moisture are about right for the most healthful inside conditions. But that is not all. You must keep the warm moist air circulating, otherwise a room becomes stagnant, foul and a germ breeder. Many people watch temperature like a hawk, but pay no attention to air circulation and humidity. Others depend upon the opening and closing of doors and air leaks around windows for circulation. This, however, is not satisfactory. One of the simplest and least expensive devices to keep the air moving is a small electric fan.



Complete bungalow service on the first floor is outstanding feature of Spanish house, Plan No. 5-S-27, shown above.

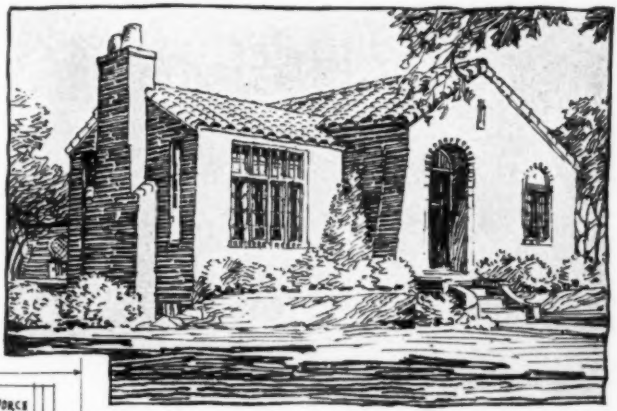
A heat regulator, one of those little clock-like devices that automatically raise and lower heating plant dampers, will keep your temperature on even keel. Warm air can be moistened in several ways. Many heating plants provide water pans automatically supplied from the water main and the warm air is thus passed over the water before it reaches the rooms. Don't be stingy about the size of this water container. Keep it filled.

Two of the best guide posts I know of toward maintaining equitable weather conditions inside your house are a thermometer and a hygrometer hanging side by side. The

Winter-Inside Your Home

HOW TO GET A BLUE PRINT AND TWO PLAN BOOKS

A one-sheet blue print of any house appearing in Modern Mechanics and Inventions magazine may be had for $1.00, postage prepaid. Two new plan books, "Homes for Newlyweds," containing 32 of the latest ideas for low cost homes in all styles, and "16 Selected Homes for Lean Purses" containing time, space, and labor-saving bungalows, may be had for 15 cents each, or both books for 25 cents, postage prepaid. Address Home Building Editor, Modern Mechanics and Inventions Magazine, Minneapolis, Minn.



Plan No. 4-B-1 is a Spanish type house done in tapestry brick with bright red tile roof. Studio living room and emergency closet are attractive features.

Here are floor plans for house No. 4-B-1, shown in top drawing. For complete blue prints send $1.00 to Modern Mechanics and Inventions Home Building Editor, 529 South 7th Street, Minneapolis, Minn.

thermometer registers temperature, and the hygrometer, something like a thermometer, registers the amount of humidity or moisture in the air. Both are relatively inexpensive. Get the habit of checking them closely each day. They will keep both doctor and fuel bills down. The success of the above recipe depends, of course, upon a house being properly insulated and weatherstripped, especially in cold climates. For once you manufacture heat, you want to prevent its escape through the roof, sidewalls and around doors and windows.

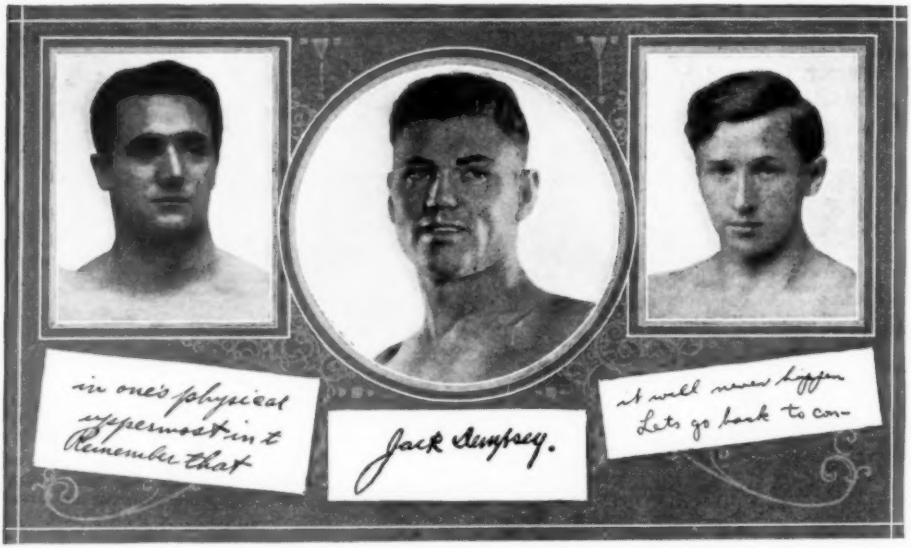
And now about the two houses appearing in this issue. You have noticed how chimneys have slowly moved from their original position at the rear of the house, and now you find them conspicuously out in front playing an important role in ornamental makeup. That is especially true in the newer types of houses showing earmarks of Spanish and Italian style, such as Plan No. 5-S-27. The chimney of stucco and native field stone, while perhaps a bit theatrical, is nevertheless in line with modern tendencies. Notice how the roof line is brought down over the arched service entrance, making the house appear wider than it really is.

This collapsible breakfast nook when closed occupies less than six inches, and saves considerable space in house No. 4-B-1.

This house is extremely popular with builders who want resale value. The plan offers five rooms on the first floor and space above for two more bedrooms, making a total of four bedrooms. The first floor offers complete bungalow service. You might finish the second floor later if you wish to save on initial outlay.

(Continued on page 189)

Your Handwriting Analyzed Free



Handwriting specimens of Charles Atlas (left), world's most perfect man, Jack Dempsey (center), and Harry Luft (right), world's strongest boy, all show love of physical activity. For a free analysis of your handwriting, send specimen to M. N. Bunker, care of Modern Mechanics, Minneapolis, Minn.

A MAN who possesses remarkable strength will not write differently from a man lacking such strength unless he also thinks differently, is the discovery made by Mr. M. N. Bunker, grapho-analyst whose work in handwriting is attracting international attention.

If the handwriting portrays an unusual amount of energy it is because the writer is an unusually energetic thinker. In specimen at the left, above, you have the writing of Charles Atlas, proclaimed to be the world's most perfect man. This writing shows great initiative and aggressiveness. It shows a man who is capable of much enthusiasm, and of keen thinking, but these qualities are present along with remarkable physical development, rather than depending upon it.

A much less powerful man might have the same amount of enthusiasm about anything of interest. He might think just as rapidly, or might show any of the other characteristics shown by this specimen.

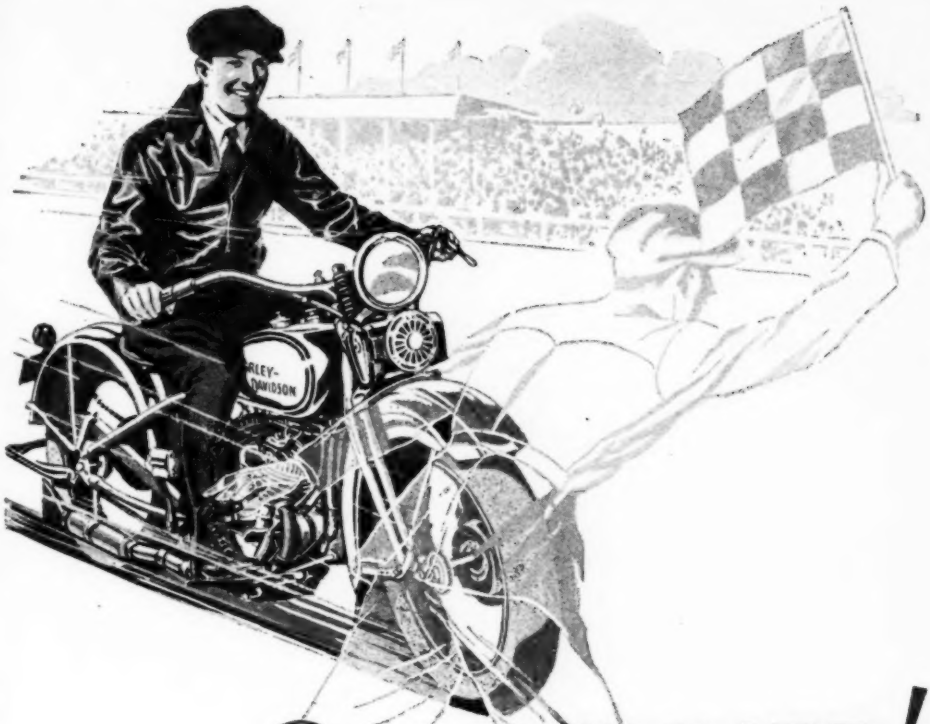
These qualities are not so prominent in the writing of Harry Luft, known as the world's strongest boy. In his handwriting at the right, above, the small letter "p" shows a tremendous love for physical activity. Harry Luft revels in physical activity, and shows this in his large loops at the time he writes "happen" with two "p's".

In the first specimen the writer is reaching out to accomplish more, to find new opportunities, while in the second there is real joy in physical activity.

There is nothing of the quarrelsome in either writing—nothing of the fighter who wants to be engaged in physical combat. Such traits are not the result of physical strength or joy in using such strength, but come from other traits shown in other strokes and letters of the writing.

The signature of Jack Dempsey in the center, above, shows aggressiveness, a desire to get things done, to forge ahead. These traits more than any others have marked much of his fighting career.

You may not have the slightest inclination to become a champion athlete, but no matter what your natural talent or ability, it will show in your writing. You may learn something of what your handwriting reveals in a personal letter to Mr. Bunker. Send a stamped, self-addressed envelope to M. N. Bunker, care of Modern Mechanics and Inventions, 529 South 7th St., Minneapolis, Minn.



Ride a WINNER!

Won in 1931 by Harley-Davidson:

Syracuse Races—3 National Championships won on Sept. 12th—5-, 10-, and 15-mile races, and the 10-mile open.

Jack Pine Run — for American Road Championship—on Sept. 7th. Harley-Davidsons finished first and second—also won both Sidecar Classes — over 466-mile course.

National Hillclimbs — 5 of the nine National Championships—at Rochester, N. Y., and Oakland, Calif.—won by Harley-Davidsons, as were most hillclimbs in other parts of U. S. A.

RIDE the motorcycle that champions choose — the Harley-Davidson, that won most of the national championship races, endurance runs, and hillclimbs in 1931 — the champion of champions!

As you flash over the roads in *your* Harley-Davidson, it's great to realize that this wonderful motorcycle has the dazzling *speed* that won six of the nine National Championship Races run in 1931—the rugged *stamina* that took the Road Championship in the gruelling "Jack Pine Run" — and the amazing *power* that roared over the top, first, in the important hillclimbs of the year.

Look over the 1932 models of this champion motorcycle at your nearest Harley-Davidson Dealer's. Ask him about his easy Pay-As-You-Ride Plan, and *reduced prices.*

Ride a
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Dept. MM, Milwaukee, Wis.
Interested in your motorcycles.
Send literature.

Name .....

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My age is ☐ 16-19 years, ☐ 20-30 years, ☐ 31 years and up, ☐ under 16 years.
Check your age group.

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For Use on Model Planes and Model Boats

New rock bottom prices. All parts bent, formed, timed and drilled. Knock-down 3-cyl. Kit, postpaid.
Finished motor, postpaid, $2.85.
Air Tank Kit, 3"x3"x30" or smaller, postpaid, $1.95.
Tank complete, ready to use 3"x24" or 30" long, postpaid, $4.95.

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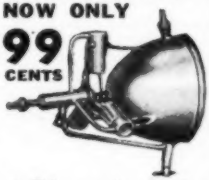

15 MODEL PLANE PLANS—ALL FOR $1.00 POSTPAID.

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3 Plans for 25c

Pfalz Pursuit, Bernardi—French Fighter, Fokker D-VIII—Flying Razor, S6-B Supermarine Racer.

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NEW SCIENTIFIC WONDER "X-RAY" CURIO

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"Silver Only"

BOYS BIG FUN. You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. FREE PKG. radio picture films, takes pictures without camera. "You'll like 'em." 1 pkg. with each 25c order.

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Every Coo-Coo $1.75 For You!

A "knock-out" instant selling hit! The Coo-Coo Auto Horn (Patented) sells itself at $4. Costs you $2.25. Going like wildfire in Hollywood and Los Angeles. One dealer sold 3,000 in short time. Some agents making as high as $25 an hour. One horn sells 5 others. **No house to house selling**—just stand around garages and service stations—coo-coo and clean up. Installed by anyone in 3 minutes. Not an exhaust or motor horn. Certain in action—never fails to create a musical note that cleverly sings "Hello."

Send $2.25 for sample horn or write for further information

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Casting Metal Toys and Novelties

We have a good opening for several ambitious men to manufacture Toy Soldiers, Animals, 5 & 10c Store Novelties, Ashtrays, etc., needed to meet big demand. High import duty and present conditions in Germany offer chance for an enormous business here. We furnish casting forms for production and co-operate in selling goods you make, also buy them from you. No experience or special place necessary. A chance of a lifetime for man with small capital. CHRISTMAS RUSH is now starting, so if you mean strictly business and want to handle wholesale orders now being placed, write AT ONCE for full information.

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1932 FLYING AND GLIDER MANUAL NOW ON SALE.

Strength Stunts Fool Friends

Leg squatting exercise is demonstrated above.

OF ALL "parlor stunts" for the home strong man, the one leg dip or squat is probably the most difficult, though the most simple appearing. For this reason it provides the "catch" that baits the unsuspecting.

Standing erect, raise one leg forward, only a little way from the floor and with the leg held straight. Now lower the body by bending the other leg at the knee until you are squatting. Next return to standing position.

Another difficult stunt is to squat on one foot, thrusting the other leg straight ahead. Then bring the extended leg back, until the weight of the body rests on that foot, at the same time shooting the foot on which you have been resting full leg-length forward.

No matter where you go there will be use for every stunt you can master, and in addition there is real fun in doing these.

FREE—a beautifully illustrated lesson which shows a number of strong man stunts and how to do them. You may have one by sending a stamped, addressed envelope to David V. Rush, care of Modern Mechanics and Inventions, 529 South Seventh St., Minneapolis, Minn. Five dollars will be paid for the most interesting strong man stunt sent in by a reader during the month, accompanied by a photo.

Two Tools *in* One!

A New Motor-Driven Tool that Achieves Amazing Results

A SCROLL SAW *with* Band Saw Efficiency

THIS new, moderately-priced tool is *radically different* from any scroll saw on the market. Runs at **full motor speed**—1800 strokes per minute—with all springing and twisting eliminated, with perfect balance and **absence of vibration!** As a result, this remarkable tool produces fine, smooth and accurate work hitherto only possible on a band saw. Has 24-inch throat capacity and it will **saw wood 2 inches thick!** Works on metal and fibre as well as wood. Has numerous special features. Can be used for filing, sanding, and honing. Send the coupon below for FREE Catalog telling all about this amazing new tool!

Delta Quality Pays in the End

Fine quality workmanship and materials are used throughout in Delta Motor-Driven Tools—even where they cannot be seen. That's why woodworkers the country over say: "Delta offers the most machine value per dollar."

10-Day Trial Easy Terms

Delta Tools are always available for a 10-Day Trial without the slightest risk. Satisfaction is guaranteed. For full details of this liberal offer and also of convenient Easy Payment Plans on larger outfits, send the coupon below TODAY!

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Send today for this Big Illustrated Book crowded with valuable information for the woodworker — professional, spare-time or hobbyist. Shows the complete 1932 line of Delta Motor-Driven Tools. Send the coupon NOW!

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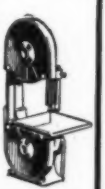
Save you time, money, and labor. They take all the drudgery out of woodworking—enable you to turn out better work in a fraction of hand time. Quickly pay for themselves. Used and recommended by thousands of home workshop owners, carpenters, contractors, farmers, and factories.

New Delta DRILL PRESS

Large capacity. Ball-bearing spindle. Automatic levelling, accurate tilting table. Many special features. Unusual value.



New Delta BAND SAW

Smooth running, efficient, safe. Ball-bearings throughout—including the blade guide. Fully guarded in every way. Graduated tilting table. Surprisingly low priced.

COMBINATION UNIT

Circular Saw, Jointer, Mortiser, all mounted on convenient, portable stand. Each tool can be operated separately or all together. No interference.

COMPLETE WORKSHOPS

All mounted on bench or convenient stands . . . available in large variety of combinations, and at prices to fit all needs.

Complete DELTA 1932 Line also includes: Woodturning Lathes, Jointers, Circular Saws, Moulding Cutters and many new accessories.

A Christmas Treat from Santa Claus

"SANTA, old man," said we, "every mail brings us a bag full of subscriptions to Modern Mechanics and Inventions — seems that every up-and-coming person in the country has decided that the magazine is a humdinger of a Christmas gift. Now, Christmas isn't so far away and we want to give these subscribers a nice present ourselves—something extra good. What have you in your pack?"

"How about a copy of **How to Build It,** the big book of home workshop plans?" said Santa. "Or the **1931 Flying and Glider Manual,** full of airplane plans? I'd be tickled pink to slip a copy of either of these books down the chimney with each yearly subscription to

MODERN MECHANICS AND INVENTIONS

So that's how we arranged it—with each yearly subscription to Modern Mechanics and Inventions, at $2.50 ($3.50 in Canada) we will send absolutely free a copy of **How to Build It** or the **1931 Flying and Glider Manual.** Be sure to specify which book you prefer. Better yet, subscribe for two years at $5.00 and receive both books free. A beautiful Christmas gift card will be mailed, if you request it, to the individual for whom the subscription is intended. Send check or money order to

Modern Mechanics and Inventions
529 S. Seventh St., Minneapolis, Minn.

Machinery Modernizes Desert

(Continued from page 143)

Cotton is picked by machinery and deposited in the truck-bodies and trailers, to be sucked out of them by vacuum pipes at the gins. There machinery does everything that is to be done to the cotton, even to baling it, and the cotton seed, a valuable by-product, is blown back into trailer boxes through pneumatic pipes. Then the seed is hauled to the oil mill, and the boxes emptied into the crushers by vacuum tubes. Old time days are long forgotten in this new machine-ruled land of cotton.

So much for the new mechanical agriculture of the desert, and yet I have touched merely on a few of the more than 200 pieces of machinery which have been devised or adapted especially for this work. Summer comes rapidly on the desert, making it essential that crops be put in with the utmost speed. To meet this need, automatic cultivators, ridgers, planters and fertilizers have been combined in one machine, operated by two men, and doing the work of a score.

Dredgers provided with their own Diesel-electric power plants dig canals 200 feet wide and fifteen feet deep, from the bottom up, instead of from the top down, while other dredgers, also about the size of Mississippi River packets, keep these canals clean. Delicate plants, such as tomatoes, cantaloupes and cucumbers, are grown under little tents, woven by thousands from the long, slender, tough leaves of the tule, better known as the cat-tail, which grows in luxuriance along the canal bank. Thus a use was found for a product hitherto wasted. Electricity is passed through the ground alongside growing hills of cucumbers, and the subsurface heat produces a crop a month earlier than anywhere else, while production is nearly twice as great as under normal conditions. Somewhat like "carrying coals to Newcastle," this application of heat to the desert, but it works!

There is some question as to which machine was the pioneer on the desert and which has had the greatest part in the conquest of the wastelands. It appears that the real mechanical pioneer of the desert was the small automobile of ubiquitous brand, which was and is able to run without roads over the level parts of the desert and some that are not so level. This car made its driver independent of distance and defiant of thirst. It

took him to find new areas of arable soil, new deposits of mineral wealth and new sources of water supply. It enabled him to escape small raiding bands of Indians and worse white men, which up to less than 20 years ago were an obstacle to desert development, and it relieved him of the menace of rattlesnakes, scorpions, Gila monsters and heat.

But the automobile served its purpose as a pioneer, and was followed by the machine which has contributed more than any other one factor to the conquest of the desert—the tractor. Laying its own roadways of steel, packing sand into a solid bed beneath its weight, breaking through ridges and smashing into gullies, immune to sandstorms and threshing through suddenly-risen freshets, it carried man and trailed his foodstuffs and tools wherever he wanted to go. It opened new mineral deposits, and it replaced the historic twenty-mule teams. It ran electric-power lines, drilling its own holes, setting its own posts and stringing its own wire as it went, delivering the completed line anywhere on the desert. It has furnished power for scores of mines and other scores of small pumping plants, and eventually it brought the paved highway to the desert.

This seems a strange statement, that a means of transportation which makes its own road should be the cause of the building of pavements, but as the tractor proved the "dry-land battleship" which whipped the desert, men began to demand greater speed in getting in their machinery and materials and in getting out their ores and agricultural products. This greater speed was available in the motor-truck. But the truck, unless it was equipped with the chain track of the tractor, could not penetrate remote parts of the desert. First, the graveled road, and then the paved highway were the answers to this demand. The motor-stage followed; the desert hotel, even the bungalow court, came into being, until, with the turning of thousands annually to the depths of Death Valley as a winter resort, the machine-won conquest of the Great American Desert was complete. From Salt Lake City to Calexico, and from Phoenix to Indio, the desert is no longer a barrier to the westward movement of civilization and production. Machinery, devised for the purpose, conquered heat, distance, thirst and bad men in a decade.

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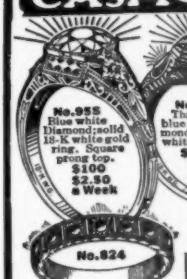

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New Steamboatin' Days

(Continued from page 105)

Steamboat racing, a thrilling form of sport unknown to the modern river boats, with their scheduled runs and orders-by-wireless evoked wild enthusiasm throughout the nation. Indeed, a skipper was a poor sport who wouldn't sacrifice safety for speed honors against a rival boat. When the *Robert E. Lee* raced the *Natchez* from New Orleans to St. Louis in 1870 people all over the country watched breathlessly and laid huge bets on their favorite contestant.

The two boats steamed out of New Orleans at 4:55 on the afternoon of June 30th, and churned the water side by side hour after hour for a day and a night, while spectators by the thousands cheered from the banks. At Devils Island a heavy fog closed in on the rivals. Capt. Leathers of the *Natchez*, a newcomer on the river, tied up six hours till the fog lifted, but Capt. Cannon of the *Robert E. Lee* sped on, defying snags and sand banks, and finally arrived in St. Louis at 11:45 in the afternoon of July 4th. The *Natchez* pulled in at 4:55 in the afternoon. 50,000 people had gathered to watch the finish. The elapsed time for the *Lee* was 3 days, 18 hours and 30 minutes over the Mississippi race course measuring 1,210 miles.

Modern safety devices, wireless and carefully dredged and marked channels have also removed from steamboating other thrills which made a river journey an adventurous undertaking. Rarely was a trip completed without an accident. Hideous boiler explosions frequently ripped vessels to pieces, strewing passengers and freight all over the water.

The most terrible disaster in the annals of steamboating was the sinking of the *Monmouth*. Traveling through Prophet Island Bend, in the Arkansas River, with 600 Creek Indians aboard, the *Monmouth* met the *Trenton* head on, and the two vessels collided in the pitch-black darkness. The *Monmouth* drifted downstream for a short distance and then, strained by the blow, broke in two, dumping her human cargo into the swirling river. Confusion reigned supreme in the darkness, and despite heroic efforts of the *Trenton's* crew, only 300 of the 600 Indians could be rescued. The accident had occurred because the *Monmouth's*

pilot failed to "keep to the right" in the narrow channel.

The *Golden Rule*, one of the fastest stern-wheelers ever floated, also went to her doom amidst the shrieks of helpless men and animals. She was lying at the Memphis waterfront discharging grain when her commander discovered fire had broken out in her innards. Thinking his boat could be saved, he cut her adrift from the docks so that she could float down stream. Out in mid-river the fire reached the oil room and there was an ear-shattering explosion. In a split second the boat was a seething inferno. Of the many passengers aboard, some jumped overboard and were rescued or drowned, while the others who refused to jump were burned to death.

Steamboat Circus

"There was a circus on board the *Golden Rule*," the account of the disaster runs. "The wild, weird cries of the maddened animals could be heard above the roaring fire and escaping steam. Two big bears managed to get out of their cage. They jumped into the river and swam ashore, where they were finally captured."

Save for the few passengers who were rescued by passing steamboats, which ventured as near to the flames as they dared, the loss of life was extremely heavy. But the accident played an important role in improving river boat safety.

The arts of war accounted for the tragic end of the famous *Alice Dean*, which engaged in trade between Cincinnati and Memphis. General John Morgan, of the Confederate army, was being hard pressed by the Union forces, which had driven him to river's edge at Bradenburg, Kentucky. Spying the *Alice Dean* heading down stream and flying the Union flag, Morgan hailed her and sent word to the captain that he wanted to get his men across the river. Under threat of a broadside from Morgan's cannon, the commander complied. When the ferrying had been accomplished, however, the Confederate general ordered all passengers ashore, sacked the boat and set her afire. When the Union troops appeared on the opposite shore, Morgan was safely out of reach and well stocked with provisions from his steamboat victim.

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Daring Death for Photographs

(Continued from page 80)

very same night. They could be obtained only through means of aviation.

We set off on the mission from Roosevelt Field, against the sage counsel of the airport officials, and flew blindly through this vast blanket of snow over rivers and mountains, reaching Auburn just as the lights in the town were being flashed on.

Working the camera as slowly as possible, we circled the flaming buildings of the prison, securing some eight or ten shots. Without pausing for food or fuel, we headed back to New York City through the snow-laden clouds. The pictures turned out to be remarkably good. By 9 p. m. they were in the hands of the picture editor, ready for public consumption.

Where thrills abound and dangers lurk one does not escape entirely unscathed. In October, 1928, in the company of Little Johnny Campion, as brave a pilot as ever manned a stick, we took off to meet the Graf Zeppelin on her maiden trip to America. Her landing was scheduled for the naval air station at Lakehurst, New Jersey.

On arriving there we found that she was still unsighted, so we decided to land. Johnny couldn't resist the temptation to show off before that great mass of people, so he dove down into the field with a roaring motor.

In some manner the ship got out of control and we crashed directly in the center of the field. Our plane was completely wrecked. I was hardly any better off. The surgeons in the naval hospital thought I was not worth patching up at first but after a conference they decided to put me together again. Campion was unhurt. He was killed a little later, along with three passengers, in a mishap in Pennsylvania.

The list of pictures which a flying photographer is expected to bring in to his newspaper possesses infinite variety. It has been my lot to witness, and photograph, more airplane disasters and fatalities than any other person. I have seen over 200 of them during my career, of varying degrees of tragedy. I perhaps know more aviators and mechanics intimately than any other man and it has been my great sorrow to see some of my buddies go.

I have covered every flight since the day

Daring Death for Photographs

Col. Lindbergh set out for Paris and immortal fame. I was the last to signal goodbye to Lindy as he soared over the ocean on his epochal hop.

Sporting events are often among my assignments. Rum runners in the tow of coast guard boats make good-looking art from the sky, as do parachute jumps.

Did Edison Die a Poor Man?

(Continued from page 57)

come from manufacturing and selling your products.

"You went further and said that you believe you have spent more defending your patents in court than you had ever derived from them on a royalty basis, excepting perhaps the moving picture rights. This is by far the outstanding point in this interview, since Henry Ford has corroborated these facts about you.

"Now, I would like for you to enlarge upon this. I have always thought you were never duly paid in money commensurate with your great service to the world. Millionaires have sprung up like mushrooms on your inventions, when to any normal mind it would appear that you should have been enriched more than you have been.

"How great is your fortune?

"What is your total annual income, roughly estimated?

"I don't want to pry into your business, but what you have already said makes this the big point in this interview. Please go as far as you can on this."

To which Mr. Edison replied, in his own handwriting:

"Would not like to do this for many reasons. At present my income has nearly disappeared on account of the depression in business."

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At Last—Movie Cartoons in Color

(Continued from page 73)

single drawing, fundamentally Eshbaugh starts with two colors, blue and red. "Every color," he explained, "simple as it may look, requires painstaking study. There is some halation on the celluloids that destroys color values. I found it necessary to give them a flat, 'fishy' appearance and increase their density to overcome that trouble."

In preparing for a picture, an animator draws each consecutive drawing on a board over an illuminated glass at the top of which are two steel registering pegs which fit through two holes in the paper or celluloid and hold the drawings in their proper place over the glass. This enables the animator to see the preceding drawing at the same time and to gauge the distance of the following drawings concerned in any action.

Each movement of a character must be formed by a separate drawing properly placed. For example, in order that Goofy may step from the right foot to the left, five drawings are made. Nine drawings will carry him along two steps. However, 50 drawings are required for him to walk across the screen.

The drawings for a walk are spaced less than a quarter-inch apart. A run may be spaced about three-eighths inch apart and the results after photographing and projecting will show the proper speeds for a walk or a run. The original pencil drawings are drawn in pencil on paper by the animator, then handed to the tracers who trace the drawings in ink on the transparent sheets of celluloid. This task completed, they are transferred to the color room where artists fill in the outlined drawings with the desired colors on the reverse side of the sheets. Each scene has an appropriate painted background on paper.

Having inspected the finished work, Eshbaugh then takes the completed scene of animation in the form of possibly 15,000 celluloids to the camera room and stacks them on a table in the corner. There will be a few repeats. That explains why there are about 1,000 fewer "cells" than frames on the reel.

Eshbaugh takes his seat at the camera table, the tiny motor whirring overhead. He places the sponge rubber in the center of

the table, switches on two banks of incandescent lights, fastens down the background, places on it three sheets of celluloid, trips the optical glass down in place and punches the key. The first of what in reality will be 32,000 pictures has been taken, for the camera photographs two pictures exactly alike at the same time on two separate negatives. Next Eshbaugh removes the top "cell", puts another in place and shoots again, and so on for two weeks.

The camera is all ready for a "one picture one turn of the crank" movement, a process already described. On the table directly under the lens within proper focus distance of the field are fastened two registering pegs relative to the field as those on all the drawing boards in the studio. The background and celluloids are placed over these pegs.

As Eshbaugh changed "cells" rapidly and tripped the camera, he explained the "camera angle" on colored comics.

"We run two films through the camera simultaneously," he said. "One film picks up the reds, the other gets the blues. In the past it would have been necessary to set up two cameras, making two negatives on separate machines. Naturally, it was difficult to get a perfect register, as the perforations on the side of the negative, having been cut either at different times or on different dies, did not always match. Now the film is made especially for color work and both are cut at the same time.

"The sound, which previously had been recorded on film, now is printed onto the single film which has received the two picture negatives. This new film is doubly coated to receive the two duplicate pictures on both sides. After printing, the film receives the color by means of dyes, either red and blue or red and green. The color is sprayed or floated on in long tanks, one color adhering to the one side of the film on the parts to correspond with the colors in the original drawing. This is done by the chemical reaction of the emulsion which is sensitive to the color used. The film is dried and the process is repeated in receiving the second color on the reverse side. Later the film is run through a preservative and is ready for projection."

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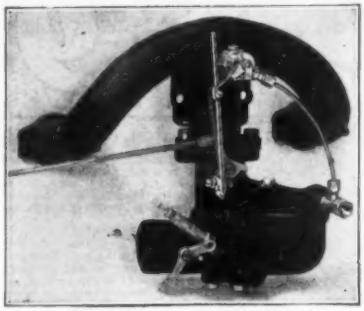

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MONEY

1932 Flying and Glider Manual Now on Sale

A Speedy Ice Yacht

(Continued from page 150)

2" thick, 6" high and 10" long. These are bolted vertically to the bottom of the runner plank at the very ends. There are two blocks to each end of the runner plank and two bolts should be placed in each block, and the blocks should be at exact right angles with the runner plank to prevent the runner from dragging. Between the blocks there should be just enough room to permit a two inch runner to work without any friction whatsoever.

The runners should be of white oak or lumber of equal strength. They are 3' long, 2" thick and 6" high and can be shaped to suit yourself. Angle irons with the sharp edge down should be bolted on the bottom. The front of the runners should be shaped up about 2" to prevent catching on the ice. The irons are to be filed until a fairly sharp edge is formed to run on the ice.

One runner is placed between the runner blocks on each side and the other at the rear of the cockpit. To fasten the front runners, a bolt is placed through the blocks and runner, allowing enough room, perhaps 2", between the runner and the runner plank to permit a little play in case of rough ice. In bolting your runners on, put ⅔ of the runner in front of the bolt and the other ⅓ behind.

The rear runner is now ready to be placed in position. The holes that were bored in the two pieces at the rear of the cockpit must be placed so that the tiller post is absolutely vertical.

The tiller post is a round section of iron split at the bottom so as to go on both sides of the runner. A bolt is placed through the tiller post and the runner loose enough to allow a little play. This tiller post should extend about 6" above the top of the cockpit and have 2" of threads so that when the tiller is placed on the post, a bolt may be screwed on to hold it tight. The tiller may be any length to suit the person who owns the boat but it has to be long enough so that one can get sufficient leverage.

The sail is to be made of medium-weight canvas, 16' by 13' by 12', and is to be double sewed all over to insure against tearing out. Around all three sides of the sail, a small but strong rope should be double or triple sewed into the edge of the

sail; when cutting allow about three inches on all sides for this extra sewing.

The boom and gaff are 2x4's 14' and 17' long, respectively. As they receive a great amount of strain, they have to be made of new lumber without any defects or any serious knots along their entire length. The sail is roped to the boom and gaff; that is, the rope goes through the brass eyelets in the sail and then out around the 2x4. This process is repeated until one gets to the end of the timber.

A rope is now put on to control the sail. It is fastened to the rear of the cockpit, then up through a pulley at the end of the boom and along the boom for 6 or 8 feet to another pulley and finally down to the cockpit where it is handy for the operator.

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by ADELA ROGERS ST. JOHNS

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Also—**Clark Gable, The Ideal Lover,** a frank discussion of the qualities which give the screen's sensational new lover his appeal; **The Strangest Man In the World**—he lives in Hollywood—his name is known to everyone—who is he?; Personal sketches of Billy Dove, James Cagney and Mickey Mouse. These and numerous other outstanding features appear in

January

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If your news dealer is sold out, send 25c in stamps or coin to SCREEN PLAY Magazine, 529 South Seventh Street, Minneapolis, Minn., and your copy of January SCREEN PLAY will be mailed to you immediately.

Wind Wrecking-Crew of Nature

(Continued from page 98)

usually blows harder in the upper strata of the atmosphere than it does at the surface of the ground. Airplanes, heading into the wind at a speed of a hundred miles an hour, or more, at altitudes of only a quarter, or a half, a mile above the ground, sometimes appear to be standing still while only moderate breezes are being experienced at the ground level.

A few years ago an aviator, trying for an altitude record near Dayton, Ohio, found the wind, at a height of about six miles above the ground, to be blowing from west to east at a speed of about three hundred miles an hour. No unusual winds were being experienced at the surface of the ground at the time.

The windiest place in this country is said to be the summit of Mount Washington, in northern New Hampshire, where a wind velocity of 140 miles an hour was observed in January, 1878. The velocity recorded at the time was 186 miles an hour. However, the Great Plains of mid-western United States are noted for their long continued and steady wind velocities, winds of from fifteen to twenty-five miles an hour sometimes blowing continuously for several days at a time. The use of ice and snow boats in such territories during the winter months provides an interesting outdoor amusement as well as a rapid means of transportation.

Wind formations in sandy sections of the country cause the interesting sand dune formations which move slowly across the landscape, overwhelming forests, buildings, and other objects in their paths. Sometimes the dunes attain great heights. Some of those in the San Luis Valley of south central Colorado are as much as seven or eight hundred feet above the surrounding land levels. Sometimes the wind erodes loose soils so rapidly that windbreaks have to be built close together to keep valuable fields from blowing away. This is especially true in the case of the peat soils so valuable in the growth of root crops. In arid countries wind action, aided by such local intense rainfall as may occur, often produces interesting erosion effects.

Wind movements in arid, or desert, countries sometimes pick up huge quantities of dust, or sand, causing the occurrence of dust storms, or sand storms. The effects of

Wind Wrecking-Crew of Nature

such storms are sometimes felt long distances from the actual locations of the storms. The effects of a dust storm in western Oregon, in the fall of 1930, were felt as far as two hundred miles out on the Pacific Ocean.

The unusually intense air movements which occur during tornadoes often lift heavy objects into the air and carry them long distances. Pieces of roofs have been carried more than fifteen miles from their original locations. Sometimes such winds sweep the water out of fish ponds, lift the fish into the air, and carry them many miles before they finally fall to the ground as rains of fishes. A rancher in New Mexico picked up more than a hundred catfish, from six to ten inches long, after a heavy rain in September, 1930, the fish having come down with the rain many miles from the nearest lakes or ponds. Sometimes oranges, frogs, grain, and the like are picked up, transported, and precipitated with the rain. There is one case on record where a young alligator, two feet long, came down with the rain.

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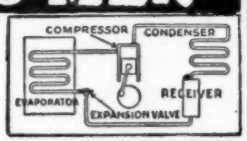

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Brighten Your Christmas Tree

(Continued from page 134)

straps can then be applied to the top edge of the mesh and the straps hung over the trim.

Suppose you want a large sign for either inside or outside display. Make an open top box of strong wood the length desired, about 1 foot high and 4 inches deep (Fig. 3). The front is composed of a sheet of light-weight wall board with the letters or design cut out. For lettering, make the characters in stencil effect so binders may be left between the uprights and other parts of the letter. Turn the front over and glue a sheet of pongee or tracing cloth over the back face of the letters. Now nail the wallboard to the front of the box and hang the latter in the place desired and plug in the lamps.

Silhouettes can be nicely fitted to illuminated fronts by the construction of a box to contain the bulbs and then fitted with a hinged frame over which is glued any suitable material such as pongee, tracing cloth or gauze. The silhouettes can be cut from black paper and pasted directly over the translucent material.

Now about ornaments. Cylindrical ornaments are coming more in vogue as their artistic possibilities are recognized. Any one can make cylindrical ornaments very easily with paper, colored cellophane, corks and pieces of spring wire. Fig. 5 shows how this is done. The corks can be acquired at any drugstore. The best way to make them conical is to rub them on medium sandpaper. Twenty-pound—or heavier—white, bond paper is used for the body of the ornaments. The paper is rolled into a tube as shown and a sheet of colored cellophane serves as an outside wrapper. The cellophane should be wider than the length of the paper tube, and at the top it is crimped around the tapered cork and tied with silk thread and not glued.

"Icicles" enhance the appearance of a Christmas tree. Aluminum foil is usually used for this effect, but very good "icicles" can be made by cutting clear cellophane into narrow strips. To do this in a neat manner, the sheets of cellophane should be held between sheets of bristol board or cardboard and cut with photographers' trimming shears. Or a handy multiple cutter can be made with a group of discarded razor blades, as illustrated in Fig. 6.

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PARTIAL LIST OF CONTENTS

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Building the Ramsey Flying Bathtub
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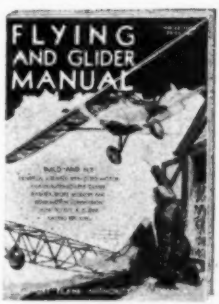

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Money for Needed Inventions

(Continued from page 83)

was filled preparatory to use.

Exploitation: Should be sold outright to some large tool manufacturer and should be patented in all foreign countries. Such a gadget should be worth at least $50,000.

2. Non-Slipping Watch Strap

WHO wears a wrist watch that does not have a tendency to slip around the wrist and who is not constantly bringing the watch back to its proper position? Can't one of you fellows find a simple—disgustingly simple, I should say—method of preventing this? Not an idea that would make you a million dollars, but I will wager that you would not get poor doing it.

Specifications: The device or the method should not interfere with artistic effect and should cost but a few pennies.

Exploitation: Should be patented only in this country and should be sold outright for a modest sum, say $5,000.

3. Self-Wiping Safety Blade

HERE is a winner and when I say a winner I mean it. Who is the man that likes to take the blade out of his safety razor after he has finished shaving to wipe it off? I have to do it for the sake of economy, but I don't like it. All thrifty men feel the same way about it. We cannot all afford the luxury of one blade per shave.

The problem is the removal of the blade and the wiping of it, for there are many things that we would rather handle than a safety blade. Now who is going to invent a razor that will permit the blade to be wiped without removal from the razor? It is a neat little problem *and would I like to be the lucky son-of-a-gun who invents such a thing.*

Specifications: Inexpensively designed—that is the first thing, for it should add very little, if anything, to the cost. Furthermore, it should not make it necessary to depart from standard practice in the design of safety razors.

Exploitation: Should be patented in every major country and should be sold on a royalty basis with a down payment of not less than $50,000. A man with this

solution will be in a position to talk high-priced turkey to the largest manufacturer.

4. Heat-Proof Auto Paint

HERE is a problem that would be worth a riot of money if it could be solved in a *simple* way. The top of the hood over the motor is the first part of the paint, especially on the manifold side, to give way, due to the high heat. There should be some way of insulating this portion of the car so that this destructive effect could be mitigated if not entirely eliminated. It might be done by developing a special paint that would expand in proportion to the expansion of the metal upon which it is used.

It is barely possible that the problem could be solved by a purely mechanical method. I happen to know where a lot of money could be had for a really practical method.

Specifications: Absolute simplicity and very small cost, certainly not more than one dollar per car. It should be a device that would require no attention and need no repairing. Naturally it should not be visible.

Exploitation: Should be patented only in the United States and should be licensed for use to all of the motor manufacturers or sold outright to one provided that a sufficiently large sum could be obtained. And what is the sum? Well, $100,000 would *not* be too much. See what you can do about it.

5. A Really Black Pencil

HERE is something for the fellow who likes to mess about with chemicals. Although lead pencils have been with us for countless years, they are just about where they started—save for the little rubber on the end.

What is needed is a pencil that will write *black* and not *gray*. It should also be indelible. The present indelible pencils write blue and they are poisonous. Putting them on the tongue is dangerous and also frightfully unpleasant. So here's your chance, Young Chemical Engineers.

Specifications: A harmless chemical compound or mechanical mixture should be used for the lead. It should be very diffi-

(Continued on page 188)

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Money for Needed Inventions

(Continued from page 187)

cult to erase the mark left by the pencil and the writing should be jet black. The cost per pencil should be kept within ten cents.

Exploitation: The patent rights should be sold to several large pencil manufacturers throughout the world and a royalty should be insisted upon. The patent should be executed in all of the principal countries.

6. Combination Lighter and Holder

I HAVE often wondered why some ingenious fellow does not design a combination cigarette case and lighter. It would certainly be appreciated by every chronic smoker. Of course, a bigger idea would be that of inventing a case that would light the cigarets automatically. However, that is quite an order and perhaps it would be best to stick to the original suggestion. At any rate, a good design that would be both artistic and practical would meet with ready approval.

Specifications: Should not occupy any more space than an ordinary cigaret case and should not be too heavy. The shape should also be the same as an ordinary case.

Exploitation: The combination might be fully covered by a design patent which would cost less and be just as effective as a regular patent. Such an idea should be worth about $5,000.

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(Continued from page 167)

The house is frame construction with stucco on metal lath and shingle roof. It builds equally well in brick, either solid brick or brick veneer, as shown in the smaller illustration, Plan No. 5-BV-17. There is a full basement and complete insulation. The cost, according to the designer, will vary, depending upon how and where the house is built. The suggested price range is $6000, up and down. Resale value is high, according to builders.

Plan No. 4-B-I is a Spanish house done in tapestry brick with bright red tile roof. Rather expensive, yes, because face brick and roofing tile are about the most expensive materials used for home building, but then they are also among the most lasting. And if money must be saved it can be done by using whitewashed common brick for the walls and composition roofing such as asbestos shingles for the clay tile.

The big studio living room is unusually interesting. There's a massive fireplace flanked by tall narrow windows, one of which overlooks a terrace in the rear.

The cost to build will vary widely depending upon materials. In lieu of masonry it could be built of frame and stucco. In this construction it might run $5000. Built of brick it may run between $6500 and $8000.

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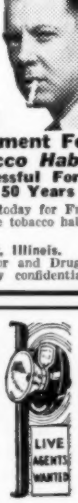

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Aquarium Keeps Fish in Health

(Continued from page 90)

about 7,500 specimens of them. Some of the specimens live only a few days or weeks in captivity, and must be replaced several times a year. The eighty-six reserve tanks behind the scenes hold several thousand fish, extra specimens to replace those dying in the exhibition tanks, fish that are being treated for disease and injury, and new arrivals being given a chance to become tame and reconciled to tank life before they go on display.

One difficulty in collecting fish for exhibition is getting them to the aquarium. Collections on salt water can be delivered by sea, but the fish suffer occasionally from seasickness during the journey. Our fish suffer from car sickness. We starve them two or three days before starting the journey so they will have empty stomachs, and so decrease the chance of their polluting the water when sick, but the short, rapid jerks of a railroad car are so much worse than the long roll of a ship that we still have a higher percentage of loss from this cause.

Many of the specimens become very tame in captivity. We encourage our attendants to become friends with their charges. In one tank we have a three-foot green turtle that's a pest for petting. As soon as he sights any one beside his tank he rises to the surface to have his head and back scratched. The same tank houses an eight-foot nurse shark, two smaller sharks, two saw fishes, and two large drums, which make a drumming noise when frightened, and all get along well together.

One of the oddest exhibits is the tank of mudspringers from Africa. They spend more time out of the water than they do in it. They scratch their faces with their fins, using them like fingers, and they use the spring in their tail to leap at their prey, just as a snake does. In other words the mudspringer is a living example of evolution at work. The salt water batfish is another, with a fin developing into a foot, so the batfish has trouble swimming at all. In all the 25,000 known species of fish the batfish is near the bottom of the list, as the farthest removed from the original fish ancestral type and the nearest to developing into something else.

Another peculiar fish is the East Indian climbing perch in our Japanese room. It

travels across land from one pool to another by hooking spines on its gills into the ground and then closing the gill to pull its body forward.

An exhibition of cowfish is proving the despair of our water color artist. They have millions of microscopic sacks in the skin by which they can change the colors of their bodies at will. The artist starts to paint one and every time he looks at it the color pattern is different.

Many visitors wonder where aquarists are trained. There is no college course in the keeping of living fish, though there are plenty in the far less interesting—to my mind—science of studying dead ones. Our people, like myself, were all amateur fish fanciers. The curator of the fresh water fish collection, for example, was formerly a steam fitter who, like me, kept his thirty or forty tanks of fish at home, experimented with cross-breeding to produce new variations, was secretary of a fish fanciers' club, and, eventually made his hobby his vocation.

His former occupation makes him feel at home backstage. We have five main water systems there, with an intricate system of valves and piping. The fresh water fish are supplied through three water systems—heated, natural and refrigerated—with water from a million-gallon supply system, which is procured direct from Lake Michigan, close to the aquarium. The salt water system is divided into two parts, heated water for tropical fish and cooled water for the northern ocean specimens. Our million gallons of salt water is divided, 600,000 gallons for the tropical reservoir and 400,000 for the numerically smaller northern ocean exhibit.

Feeding in a big aquarium is quite a problem. Our 7,500 specimens require an enormous list of foods, ranging from microscopic living creatures up to fish and meats. The goldfish and some of the tropical fish are fed daphnia, a tiny crustacean distantly related to the common crayfish. Daphnia are not hard to collect, but so small it is hard to get enough. We send men out three times a week and they can't gather enough to feed all the fish in the Japanese room, so the larger and less valuable goldfish get the ordinary cereal foods. We are going to build a two-acre daphnia farm to help relieve this food shortage.

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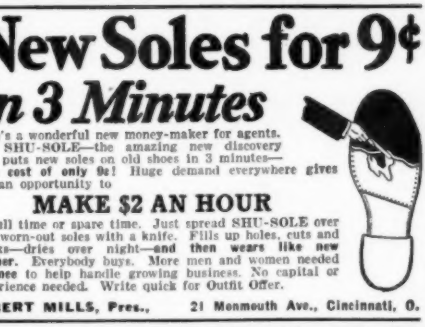
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Real Truth About the Polar Sub

(Continued from page 45)

service it rendered the expedition.

"Frank Crilley, a very expert diver, just donned his regalia when pictures had to be taken for future commercial transactions. He never went down in that diving chamber in the Arctic, not so far as I could see.

"They found another use for that diving compartment. A Plankton machine was dropped down through it, to grasp samples at the bottom, a distance of three miles. Here 50,000-watt lamps were used. It brought up a bluish mud."

These samples of mud, incidentally, were by all reports regarded very highly by the scientists of the Nautilus. The absurdity of equipping an expedition with a costly submarine and of sending it thousands of miles into the Arctic to bring back a can of blue mud undoubtedly had its humorous appeal for those who are still chuckling at the scientific pretensions of the expedition. Is it any wonder that the nation's humorists found the Nautilus an ideal target for much good-natured fun? One of the best-remembered "wisecracks" is that of Will Rogers, who remarked in his syndicated feature that what the Nautilus needed was a good tow rope—this following the mid-ocean breakdown of the motors.

There were, it is true, other scientific observations made, as Mr. Blumburg pointed out to me.

"You ask me how much actual diving we did up there? Well, the reports vary a little on that, I notice. It is my frank and honest opinion that the Nautilus at no time ever was submerged for more than 52 feet in the Arctic, and that was in 2,300 fathoms of water, about 13,800 feet.

"As to actually penetrating underneath the ice—don't let your fancy run away with your reason. The only time we really went under was once when motion pictures and still photos were planned and made.

"Just as soon as the cameras were poised on the surrounding ice-stands of vantage, the Nautilus went under ice seventeen feet thick, but for only a momentary period. It came right out and up again. At no point were we submerged for any length of time during our stay in the Arctic. It was always a matter of minutes.

"We had to go under for that brief time because too many would have scoffed at

the whole business otherwise. The reason we couldn't stay under long was because of the abnormal temperatures up there which had not been anticipated. The reaction of the temperature on the ship and its component parts had not been calculated. It would have meant ruin to have attempted any protracted stays under the ice or the water itself.

"Of course, the diving feature for the submarine was caught short early in our entrance into the Arctic zone when our diving rudder was lost. That was the only occasion when I saw Frank Crilley do any diving. He was sent down to see whether the missing rudder might not have done some extra damage to that part of the boat.

"The diving rudder was lost in 80 degrees latitude on the second week we hit the Arctic. A chunk of ice had lopped it off. No attempt was made to repair it. It would have been futile."

As regards the diving rudder, it may be pointed out that this exact accident had been predicted in the pages of this magazine months before.

"Another fantastic idea that went floppo," continued Mr. Blumburg, "was the notion that the Nautilus and the Graf Zeppelin might keep a date in the Arctic and that there even might be an exchange of passengers. As a matter of fact we were ten weeks late and when we got up there there was no Zeppelin to greet us. It had already waited too long, I have been told.

"Finally, William Randolph Hearst, the newspaper publisher who was one of the chief sponsors of the expedition, sent a radio to the Nautilus calling off activities and summoning Sir Hubert home. Any delay might have meant wiping out the entire party and I think Mr. Hearst acted with commendable sagacity."

Yet, despite the failure of the Nautilus to accomplish her goal, Sir Hubert Wilkins has demonstrated that his idea of polar submarine navigation is not impossible. Rudimentary facts have been learned, and a submarine of the latest type—not a reconditioned junked ship like the Nautilus—could carry out such a daring project successfully. Credit for the idea must always belong to Sir Hubert Wilkins, and to him alone.

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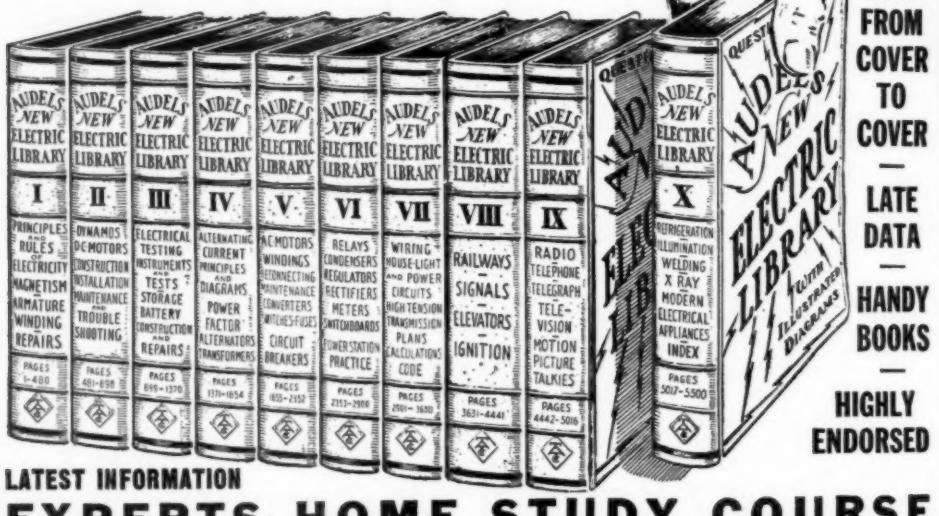
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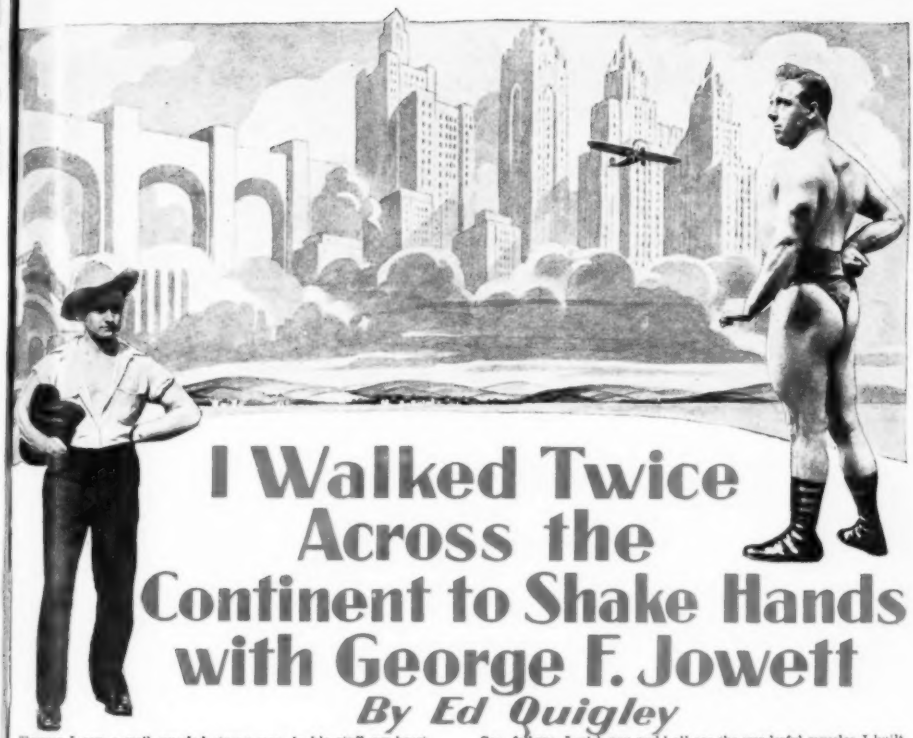

I Walked Twice Across the Continent to Shake Hands with George F. Jowett

By Ed Quigley

Whenever I saw a well-muscled strong-man do his stuff my heart would always ache with desire. Above all things in the world I craved to be strong and to have a big chest, broad shoulders and a pair of powerfully muscled arms.

On this particular occasion I sat upon a rail fence on my father's farm and I felt unusually downhearted. A piece of paper blew across the road, and as it clung to the fence post I saw imprinted upon it the figure of a powerfully developed man. Eagerly I leaped from my seat and grabbed it, and for hours I gazed upon that magnificent form with devouring eyes. Coming back to reality was what plunged me into my unusual state of downheartedness. I asked myself, "What chance have I, a tall, lanky youth, of ever becoming as powerfully developed and as strong as the man in the picture? Here I am on an Oklahoma farm with no chance of seeing or talking with such a man to learn the secret of getting strong."

Then an inspiration came to me. I would write to him—better still I would go to see him. I had no money but in the enthusiasm of my decision that did not worry me. I felt that I must see him. He had once been a weakling and knew what it was to have an miserable ache in the heart to be strong. He would understand, I was positive. I started out on my long hike from Oklahoma to Pennsylvania with all my worldly possessions wrapped up in a small bundle—a clean shirt, tooth brush, and a one dollar bill.

I walked and hitch-hiked all the way east, only stopping at one place long enough to work until I got the price of a pair of new shoes. I had worn the old shoes out in my long trek. Finally the day came when I reached the city of Scranton where this famous muscle-teacher is located. It was raining hard but my heart beat with anticipation only to be doomed with disappointment. The man I had hiked across the continent to see was out of town, but I was told that if I cared to go on to Philadelphia a wire would be sent him to wait for me. Gee! I was tickled to death. I got a lunch ride all the way through and bright and early presented myself at the Philadelphia address. Never will I forget my first sight of that man. Such shoulders! They seemed to overflow the chair in which he sat. His neck was powerful and supple—his chest broad and deep—and such arms! I thought they would burst the sleeves. Gee! but that was a happy day for me. He was wonderful. He handed me down with valuable advice about my training.

I left Philadelphia on my hike back to Oklahoma with a new song in my heart. When I got home I started right away to put into practice all he had told me. Day by day I could see my muscles grow, and my strength increased at a wonderful rate. By the following year I was marvelously improved, and I determined on another hike across the continent to see my famous friend, ideal and teacher. He was delighted with my physical improvement. He told me he knew I would make good because a fellow who really wants a thing bad enough will go out and get it in spite of all.

Gee, fellows, I wish you could all see the wonderful muscles I built for myself and the great strength that each muscle has. I wish you could have the same grand experience I had, but you can if you want. It is simply a matter of wanting a well developed body and starting out right to get it.

I walked four times across the continent to see this great teacher and it was the best thing that I ever did. Some day I am going to be famous and every bit as strong as my ideal is. He said it was quite possible. I can't help but win, and with the wonderful start I now have with my well developed body I am going to lick the world. So can you. It makes no difference whether you live on a farm or in the city. The whole thing is to determine you want a well developed body with muscles of steel and you will get them. You can have health, strength, success and a body you will be proud of.

I'm positive George F. Jowett can help you! He will prove it to you! He has prepared six special courses listed in the coupon. Each specializes in moulding a definite part of the body. He doesn't ask you to enroll or sign for his full course now. Just try a test course now. Each test course is a complete course covering the subject it is written about. You'll be amazed at the results in 30 days. You'll be dazzled in 90 days. Pick out your course—rush coupon with only 25c, or if you want all six attach $1.00 to the coupon and get them all.

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